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AND

RHEUMATOID ARTHRITIS.

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A

TREATISE ON RHEUMATISM

AND

RHEUMATOID ARTHRITIS.

BY

ARCHIBALD E. GARROD, M.A., M.D., Oxon., M.R.C.P.,
ASSISTANT-PHYSICIAN TO THE WEST LONDON HOSPITAL;
LATE CASUALTY PHYSICIAN TO ST. BARTHOLOMEW'S HOSPITAL.

„Das Wenige verſchwindet leicht dem Blick,
Der vorwärts ſieht, wie viel noch übrig bleibt."
GOETHE (*Iphigenie auf Tauris*, i. 2).

With Charts and Illustrations.

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TO

My Honoured Teacher,

SIR DYCE DUCKWORTH,

M.D., LL.D.,

HONORARY PHYSICIAN TO H.R.H. THE PRINCE OF WALES;
FELLOW AND TREASURER OF THE ROYAL COLLEGE OF PHYSICIANS;
PHYSICIAN TO, AND LECTURER ON MEDICINE AT,
ST. BARTHOLOMEW'S HOSPITAL,

In grateful recognition of his
many kindnesses,

I DEDICATE THIS VOLUME.

PREFACE.

Although the literature of Rheumatism is very extensive, and although the great advances which have been made in our knowledge of the disease of recent years have greatly modified the views formerly held concerning it, yet the various contributions to the subject are, for the most part, scattered through the Transactions of Societies and the Medical Journals, and have not often been brought together in the Treatise form. I therefore felt, in accepting the invitation of my publishers to write a work upon the subject, that I might be doing a service to medical science if I endeavoured to present a consistent picture of Rheumatism as a systemic disease, of which the articular lesions are, at the same time, the most frequent and conspicuous manifestations, but which also implicates many other structures and tissues of the body, and assumes widely different forms in different cases. How far the outcome of this attempt falls short of its aim, I am only too conscious; but I trust that the work will nevertheless prove useful to those who are anxious to form a notion of the present position of our knowledge of the subject.

It has been my endeavour to restrict the denotation of the words "Rheumatism" and "Rheumatic," which are often so loosely employed that they have almost forfeited all claim to be regarded as scientific terms, to one definite set of phenomena, which I believe to depend upon one single and specific morbid process, of the nature of which it is not yet possible to speak with any degree of certainty.

The latter portion of the book treats of Rheumatoid Arthritis, which I believe to be, unlike Rheumatism, an essentially articular affection, the lesions of which are dependent upon trophic disturbances. My object in including the two diseases in the same volume is that I may contrast rather than compare their pheno-

mena, believing that they are essentially distinct in their nature, although a place must be assigned to Rheumatoid Arthritis among the sequelæ of true Rheumatism.

The references to the various writings which are quoted in the text, as well as to many others to which no allusion is made, have been embodied in a Bibliography, which will be found at the end of the volume. In this the names are arranged in alphabetical order, under headings that follow as closely as possible the order in which the subjects are treated in the body of the work. I trust, therefore, that no difficulty will be met with in finding any reference required.

In conclusion, I have derived much assistance from the valuable and comprehensive articles of M. E. Besnier in the *Dictionnaire Encyclopédique des Sciences Médicales*, of M. Homolle in the *Dictionnaire de Médicine et de Chirurgie Pratiques*, and of Professor Senator in *Ziemssen's Handbuch*.

My father, Sir Alfred Garrod, has rendered me most valuable aid by placing his Hospital Note-books at my disposal, and from these I have extracted, amongst other things, Temperature Charts of cases treated on the expectant plan, prior to the introduction of the salicylic drugs. My best thanks are due to Dr. Andrew, Sir Dyce Duckworth, and Dr. Samuel West, who have not only given me access to their Hospital Notes, but have also allowed me to quote cases under their care in the Wards of St. Bartholomew's Hospital. I would also express my obligation to the Museum Committee of St. Bartholomew's for allowing me to have drawings made from specimens in the Museum. To Dr. Cheadle and Dr. Barlow, whose teachings supply the keynote of a large portion of this work, I am greatly indebted for the drawings which they have kindly allowed me to use. I am also very grateful to friends who have helped me in various other ways, and especially to Dr. Herringham for his valuable criticism and suggestions; to Mr. Leonard Mark and Dr. E. T. Wynne for the drawings which they have been good enough to make for me, and which have been so admirably rendered by Mr. Danielsson; and to Dr. Steavenson for his excellent account of the electrical treatment of Rheumatoid Arthritis.

ARCHIBALD E. GARROD.

9 Chandos Street, Cavendish Square, W.,
May 1, 1890.

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A TREATISE ON RHEUMATISM

AND

RHEUMATOID ARTHRITIS.

BOOK I.—RHEUMATISM.

CHAPTER I.

HISTORICAL.

Rheumatism formerly included under the name of "arthritis"—The writings of Baillou the earliest in which a distinction is made—Sydenham—Cullen—Rheumatism regarded by some French writers as not a truly articular disease—Baillie first mentioned the rheumatic cardiac lesions, on the authority of Pitcairn—Metastases to internal organs—The discovery by Bouillaud of the frequency of cardiac lesions—The study of rheumatism in childhood—Discovery of hyperpyrexia—Theories of rheumatism—Advances in treatment.

THE word "rheumatism" is one of the most ancient of medical terms, for it is met with in the writings of early authors from Hippocrates downwards; but it was by them employed simply as a synonym of catarrh, and it was not until the seventeenth century that it began to be used in its present sense. Previous to that time the disease which is now called rheumatism was included with gout and other articular diseases under the comprehensive name of arthritis; and although in ancient writings passages occur which seem to show that the characteristic features of acute articular rheumatism did not entirely escape the notice of their authors, these were not regarded as sufficiently distinctive to warrant its differentiation from the other members of the arthritic group. Even at the present day we may perhaps trace the survival of the original meaning of the words "rheumatism" and "rheumatic" in their so frequent application to a

variety of morbid processes which have nothing in common with true rheumatism beyond the fact that they are directly attributable to cold.

It is in a posthumous work of the French physician Baillou or Ballonius, who died in the year 1616, that we find the distinction between rheumatism and gout for the first time clearly drawn, and the word "rheumatism" employed with its present meaning. Baillou described the wide distribution of the articular pains, which preclude all movement of hand or foot, and summed up by saying, that what gout is to a single joint, rheumatism is to the entire body.

Although there are very few, if any, who would still maintain the identity of rheumatism and gout, the effect of their long association may be traced throughout the history of rheumatism, in the deep-seated notion of their close relationship, in the comparison of the visceral lesions of rheumatism to the metastases of gout, and, lastly, in the idea that there is an arthritic diathesis or peculiar tissue-state upon which either disease may be developed in those who are exposed to the conditions which are its exciting causes. The ideas which found expression in the writings of Baillou do not appear to have met with any general acceptance from his contemporaries, and it is only in the works of Sydenham that we find the essential differences between rheumatism and gout once more clearly stated.

Sydenham was the first to describe the tendency of the rheumatic inflammation to change its seat from one articulation to another, and the severe constitutional disturbance which accompanies the development of the arthritis; and Boerhaave states that after searching through the literature of medicine for an adequate description of rheumatism, he had found little of any value save only in the pages of Sydenham, who attributed the scanty notice which rheumatism had received from previous medical authors to its confusion with arthritis or gout, although he considered that to a careful observer the distinction between the two presented but little difficulty.

The description which Cullen gave constituted a great advance upon everything which preceded it. Cullen speaks of the special liability of the larger joints to rheumatic inflammation, and of the free and copious sweating which is so characteristic of the disease; nor did it escape the notice of this acute observer that suppuration has no place in the rheumatic process. Neither Sydenham nor Cullen appears to have entertained any doubt that the seats of the inflammatory changes were the actual

articular structures, and Cullen even endeavoured to explain the special liability of these tissues. No less explicit are the statements upon this point of later English writers on the subject.

"The symptom peculiar to this disease," wrote Haygarth in 1805, "is an inflammation of the joints, which often increases to great violence, with swelling, soreness to the touch, and sometimes redness of the skin;" and further, "The muscles are also affected, but less generally and less severely than the joints." When, on the other hand, we turn to French writings of this period, we find that there prevailed a notion among the contemporaries of Haygarth, that whereas gout was a disease of the joint-structures proper, rheumatism had for its seat the structures near to, and between the joints, its articular localisation being rather apparent than real. This view was expressed by Barthez and by Gasc in 1803, by Landré Beauvais in 1800, and also in the earlier writings of Chomel, who afterwards saw reason to modify his opinion upon this point.

In Baillie's work on Morbid Anatomy, which was published in 1797, rheumatism is mentioned as a cause of enlargement of the heart, on the authority of Pitcairn, who did not himself publish anything upon the subject. Haygarth's essay on Rheumatic Fever contains no allusion to heart-affections, but in the years 1808–20 a number of memoirs appeared in quick succession, embodying observations which clearly proved that the graver forms of cardiac disease frequently had their origin in attacks of rheumatic fever. In Scudamore's treatise on Rheumatism, which appeared in 1827, the occurrence of a metastasis of rheumatism to the heart was clearly recognised, and examples of endocarditis and pericarditis were given, as illustrating this occurrence.

Scudamore quotes a remark of Corvisart that rheumatism is probably one of the causes of pericarditis, and also a case recorded by Burns in his observations "On Some of the most Frequent and Important Diseases of the Heart," in which a girl who had been subject to "rheumatisms" was found to have an adherent pericardium and hypertrophy of the cardiac walls. Before the introduction of the method of auscultation, it was obviously impossible to recognise the development of the slighter forms of pericarditis and endocarditis during life, and accordingly it was only in severe cases, in which obvious symptoms were produced, that the diagnosis of cardiac affection in the course of a rheumatic attack could be made. Speaking of such cases Scudamore says:—"There is not, probably, a more dangerous form of disease than

a sudden seizure of the heart during the inflammatory state of the system in acute rheumatism. The chief symptoms of this alarming malady are, a hard and rapid pulse, rather small than full, and sometimes attended with irregularity; the breathing hurried and anxious, palpitation of the heart, with occasional pain in its region, some cough, a distressed countenance, beating of the carotids, the highest state of nervous irritability."

The application of the term "metastases" to the visceral lesions of acute rheumatism was a result of the tendency to compare the phenomena of this disease with those of gout, and to regard these visceral lesions as analogous to those of retrocedent gout.

At about the same time as the cardiac lesions, the pulmonary accidents of rheumatism, and the grave cerebral disturbance to which the disease may give rise, began to be recognised, and isolated examples of rheumatic chorea were placed on record.

The year 1836 marks an important epoch in the history of the study of rheumatism, for in that year Bouillaud demonstrated that pericarditis and endocarditis are not merely rare accidents of the rheumatic state, but are present in so large a proportion of all acute cases that they must be looked upon as being no less essentially parts of the morbid process than arthritis itself. This great discovery of Bouillaud, which was only rendered possible by the introduction of the method of auscultation, laid the foundations of far wider conceptions of the nature of rheumatism than had hitherto prevailed, and has rendered it necessary to assign to this disease a place among the systemic maladies. The violent opposition which the statements of Bouillaud at first encountered has long died away, and no one now questions the great liability of the heart to be attacked in the course of rheumatic fever. The only doubt which remains is as to the exact frequency of the cardiac affection. It soon became evident that not only endocarditis and pericarditis, but also the other visceral lesions which arise in its course are, in like manner, primary manifestations of a single morbid process, which may attack a great variety of organs and tissues. Nothing has contributed more to the teaching of this important lesson than the study of the peculiar and abnormal forms which rheumatism is apt to assume in childhood, in many of which the articular structures either escape entirely, or are only involved to a very trifling degree.

If it be once granted that an attack of chorea with endocarditis, or an eruption of a cutaneous erythema, may constitute as truly a rheumatic attack as the most severe forms of articular lesions, it is obvious that arthritis must be deposed from the

position of the essential rheumatic lesion, and must be looked upon merely as the most constant and conspicuous of the manifestations of the disease.

The study of the rheumatism of childhood has further been rewarded by the recognition of a manifestation of rheumatism the value of which as a diagnostic sign can hardly be over-estimated; for the fibrous subcutaneous nodules, the import of which was earliest recognised by Meynet of Lyons in 1875, and which have since been so carefully studied by Hirschsprung, Barlow, and Warner, and many others, are not as yet known to be produced by the action of any other morbid process besides rheumatism.

The introduction of the thermometer as an instrument of clinical research was before long followed by the discovery of the remarkable degree of thermal disturbance which is so constantly present in cases of cerebral rheumatism, and this discovery has led to the adoption of a line of treatment which has robbed these grave cases of much of their terror.

Several theories have been advanced to explain the phenomena of rheumatism. Some have regarded endocarditis as the primary event, upon which all the other lesions depend. According to another view, the phenomena of rheumatism have their origin in some disturbance of the central nervous system; this disturbance is by some attributed to the effect of a surface chill upon the cutaneous nerves of the chilled area; by others, to the immediate action of a chemical or organised poison upon the great nerve-centres. Probably the theory which has obtained the most general acceptance, in this country at least, is that which attributes the disease to the presence in the system of an excess of lactic acid, which is supposed to play a part analogous to that of uric acid in gout. Lastly, it has been suggested that rheumatism is an infective disease, and this view has of late years gained many adherents. Much may be said in favour of this theory, and there are certain characters of the malady for which it alone can make any attempt to account. None of these theories can claim to be clearly established, and no one of them has met with at all universal acceptance; and it must be acknowledged that, in spite of the great progress which has been made in the study of the clinical aspects of the disease, the problem of its pathology still remains unsolved.

The general treatment of rheumatism was for a long time extremely unsatisfactory, so that after many remedies had been strongly recommended in turn, there were not wanting those who asserted that, provided that rest and suitable diet were insisted

upon, the cases did just as well without any drug treatment at all, as under any plan of treatment which had been proposed. Of late years, however, there has been a great change in this respect, for the introduction of the salicylic compounds—by Buss in Switzerland, by Reiss and Stricker in Germany, and by Maclagan in this country—has supplied a means of controlling some, at least, of the phases of the morbid process, and marks an advance in therapeutics, the greatness of which few will question, and the full value of which it is not even yet possible to estimate.

CHAPTER II.

THE PROVINCE OF RHEUMATISM.

The word "rheumatism" very loosely applied—Acute articular rheumatism the typical rheumatic affection—True rheumatic manifestations are met with in direct association therewith—Some affections called rheumatic are not really of this nature ; some others not so called are probably true rheumatic manifestations —The manifestations of rheumatism have no pathognomonic characters—Their nature is recognised from family history, clinical association or sequence, and, to some extent, from the effects of treatment—The nature of the rheumatic lesions —Their classification—Erythematous and fibrous lesions—Secondary rheumatic lesions—The lesions which are thought to depend upon the rheumatic diathesis —Rheumatism a specific and systemic disease—Its constitutional nature doubtful —The supposed relationship of rheumatism and gout—Arguments for and against this relationship.

Great difficulties surround the attempt to define the province of rheumatism with any degree of accuracy—difficulties which result from the fact that at the present day a great variety of disorders are popularly styled "rheumatic," which have no real connection either with each other, or with the more typical forms of the disease. Indeed, the word is used as a convenient designation for any ache or pain which does not readily fall under any other category. It is obvious, then, that in attempting to define the province of rheumatism, it is necessary to contract its boundaries, by rejecting, as far as possible, those extraneous affections which they have been made to include. This can only be effected by taking acute articular rheumatism as the typical rheumatic affection, and by refusing to recognise as rheumatic any morbid conditions which are not occasionally met with in such direct association, or in such obvious connection with articular attacks, that they must be regarded as manifestations of one and the same morbid process. By so doing it is possible to obtain a fairly distinct clinical picture of rheumatism as a definite, systemic, and specific malady.

Among the lesions which must be excluded are many forms

of arthritis which are developed as manifestations of other and distinct disorders, or result from secondary septic infection, but which have long been grouped under the name of secondary or pseudo-rheumatism. The use of such appellations has apparently arisen from the fact that the *rheumatic* has always been the least clearly defind group of articular lesions, and has consequently served as a convenient resting-place for any obscure forms. But rheumatism is far more than a mere disease of the joints, and no form of arthritis can establish a claim to be regarded as rheumatic unless it is frequently attended by some at least of its visceral lesions. Such association is observed in the case of only one of the so-called secondary rheumatic affections, namely, that which is so frequently developed in the course of scarlatina. It is further necessary to exclude from the rheumatic category a number of painful disorders, which have no further claim to the epithet "rheumatic" than that they usually result from exposure to cold or damp. Such are many of the obscure pains grouped together under the name of muscular rheumatism.

On the other hand, certain affections, such as chorea and erythema, which are not usually called rheumatic, occur so frequently in the course of unequivocal attacks of rheumatism, or are developed so often in patients who come of rheumatic families, or have themselves, at some previous time, exhibited other manifestations of the disease, that they cannot but be regarded as rheumatic lesions, and it is consequently necessary to enlarge the boundaries in some directions, whilst contracting them in others.

With hardly an exception, the rheumatic manifestations present no characteristic features by which their origin can be at once recognised, and almost all of them may be developed under the influence of other causes besides rheumatism. They affect so many different organs and tissues, and have, at first sight, so little in common, that it is difficult to realise that they form part of one single morbid process.

The evidence which leads to their inclusion in the rheumatic group is almost entirely clinical, for rheumatism has little morbid anatomy, a row of beads upon the cardiac valves, or a deposit of lymph upon the surfaces of the pericardium, being in most instances the only changes found after death in the bodies of those who have succumbed to an acute attack. The clinical evidence is of several kinds, being in part derived from the special liability of the members of rheumatic families to the particular lesion in question, in part from the frequent association of such lesions with others which are usually of rheumatic

origin, and in part from the results of particular kinds of treatment. The evidence of the second kind is by far the most important, for every true rheumatic manifestation sometimes appears in the course of typical attacks of rheumatic fever, and this with sufficient frequency to exclude the probability of an accidental concurrence. In particular cases the evidence from heredity is often of great value, and in children especially, the knowledge that one or other parent has suffered from rheumatic fever will often serve to throw important light upon the nature of an obscure case. In the same way the personal history of an attack of rheumatic fever may afford considerable help, especially if the accuracy of the patient's account is rendered more than probable by the presence of resulting cardiac lesions. Unfortunately, in connection with this, as with other diseases, hearsay evidence is, of necessity, extremely unsatisfactory, for the information which the patients can supply, even if sufficiently distinct to be of any value, is usually limited to a history of pain and swelling of joints, or of an attack of chorea. Not infrequently all these sources of evidence fail us, and an isolated rheumatic lesion is unrecognisable as such when it appears in one who has shown no previous sign of the malady, and does not come of a rheumatic stock, until its true nature is revealed by the subsequent development of other members of the rheumatic series.

Although arthritis, endocarditis, erythema, and chorea, to mention some only of these events, may each result from other causes besides rheumatism, there is no other disease which can produce them all, and when they appear in direct association or in succession in the same patient, the rheumatic origin of the entire series is hardly open to question. Their diagnostic value is, however, very unequal, for whereas some of these lesions are seldom rheumatic, others have rarely any other than a rheumatic origin, and the subcutaneous fibrous nodules are perhaps pathognomonic of the disease under discussion. Endocarditis, again, is so very frequently of a rheumatic nature, that its development in any given case is rightly held to afford strong evidence that the attack of which it forms part is an attack of rheumatism, and that any patient in whom the valvular lesions to which it gives origin are observed, has been at some time a rheumatic subject.

Evidence from the results of treatment seldom carries any very great weight, and it is only since the introduction of the salicylic drugs that any such evidence has been forthcoming in connection with rheumatism. With regard to the general ques-

tion of what are, and what are not, rheumatic lesions, it affords but little aid, although in particular instances it may be useful; it would, however, be unsafe to assert that any arthritis which yields to the salicylates is rheumatic, and any which does not so yield is of some other nature.

The question whether the lesions of rheumatism should be regarded as inflammatory in the ordinary sense of the term, is one which has provoked a great deal of discussion. Bouillaud, who maintained that suppuration is a common event in rheumatic cases, looked upon rheumatism as an essentially inflammatory disease, and considered that the rheumatic lesions differ only in their causation from the ordinary forms of inflammatory affections. Others, amongst whom were Stoll, Chomel, Requin, and Trousseau, regarded rheumatic inflammation as a morbid process of a distinct type, differing from ordinary inflammatory processes in its mild and transitory character, and in its so frequent termination in complete resolution, without suppuration, and without the production of any permanent changes in the affected parts. These different views were well summed up by Fernet in his graduation thesis, where, after pointing out that in ordinary inflammatory processes both vascular and parenchymatous changes take part, he shows that in the rheumatic lesions the first of these changes is far more conspicuous than the second.

This author says:—"The articular manifestations are the result rather of a vascular than of a parenchymatous process; the serous exudation is sometimes very abundant, but the tissue elements are, as a rule, unaltered; and this is why we find in these cases neither solid products nor pus. When the hyperæmia comes to an end, or is determined towards some fresh seat, the effused serum will be rapidly reabsorbed, and there will remain in the joint no trace of the morbid process.

"The visceral inflammations dependent upon rheumatism suggest similar reflections, and one may, I think, characterise anatomically the rheumatic inflammations by saying that they consist chiefly in a hyperæmia; that they merely touch the tissues without profoundly modifying them, and that they only exceptionally lead to organic changes or to suppuration; that they are therefore intermediate between congestion and true inflammation; that they afford, in a word, examples of inflammatory hyperæmia."

These statements of Fernet's, although they are undoubtedly true of some of the rheumatic lesions, are by no means true of

all, for in many instances the rheumatic process produces very obvious changes in the tissues of the part attacked, which may either be of a temporary character, or may leave the structure irreparably damaged.

We have in this distinction the basis of a classification of the manifestations of rheumatism, for to one or other of the above groups they may nearly all be referred, in spite of their apparent diversity.

The lesions in which the inflammatory process does not proceed beyond the stage of active hyperæmia are those which commence acutely, and in the course of a few days, or even hours, subside as rapidly as they developed; but such lesions are by no means peculiar to rheumatism, for, as has been already stated, they may result from other and distinct diseases.

Those lesions which are attended with definite tissue-changes may last over a period of weeks, or even months. They are, one and all, characterised by an active overgrowth of the fibrous tissue of the affected region.

The affections of the first or hyperæmic group are, as a rule, attended by a much greater amount of febrile disturbance than those of the second or fibrous variety; and it is because the fibrous lesions play an especially prominent part in the rheumatism of childhood, that the elevation of temperature during a rheumatic attack is, as a rule, so much less marked in children than in adults. The lesions of each group, besides being alike in their essential nature, are especially apt to occur either in direct association, or in succession, in the same patient. So general is this rule, that one is to some extent justified in forming an opinion from the clinical associates of any lesion as to which of the two groups it belongs.

The cutaneous erythemata may be selected as typical examples of the first or hyperæmic group of rheumatic manifestations; and it is a matter of common observation that in cases in which an erythema constitutes the most conspicuous feature of the rheumatic attack, joint-lesions of greater or less severity are usually present; and so constantly is this the case, that some observers have questioned the rheumatic origin of the arthritis which accompanies erythema, preferring to regard it as a manifestation of a distinct disease, of which erythema is the most conspicuous outward sign. On the other hand, it is rare to meet with endocarditis in cases of this kind, although, of course, erythema and endocarditis often appear together in the course of rheumatic attacks of a more severe type. This frequent clinical

association of erythema and arthritis suggests that the two processes are probably alike in their nature, a view not incompatible with the known characters of the arthritis, which in its rapid development and equally rapid subsidence, as well as in the almost complete absence of any definite *post-mortem* changes in the joints of those who have succumbed to an attack of acute rheumatism, presents obvious analogies to the cutaneous erythemata. This is, of course, only true of the acute form of rheumatic arthritis, which alone has this extremely transitory and shifting character; whereas, in the more lasting joint-lesions, the fibrous tissue becomes involved, and the changes produced resemble more closely those of the second group. The liability of the same structure to both hyperæmic and fibrous changes is further illustrated in the case of the pericardium. A more subacute and relapsing variety of pericarditis, which is characterised by active overgrowth of fibrous tissue, and occasionally by the formation of outgrowths resembling the subcutaneous fibrous nodules, is common in rheumatic children; whereas the acute pericarditis of adults runs the course of an erythematous lesion, and is attended by much more considerable febrile disturbance. The different kinds of rheumatic sore throat are especially apt to be associated with articular lesions, and also with cutaneous erythemata apart from arthritis; and Lasègue and others have suggested that the angina is nothing else than an erythema of the fauces. Again, the pneumonia which develops in connection with rheumatism does not usually pass beyond the stage of inflammatory hyperæmia, and may therefore be probably referred to the same group. As a matter of fact, there are comparatively few cases in which the lesions of one group are alone represented; and in acute cases, such as an ordinary attack of rheumatic fever, both arthritis and endocarditis are, as a rule, present.

Endocarditis is the most typical member of the second or fibrous group of rheumatic lesions, being characterised by the active proliferation of the fibrous tissue underlying the lining endothelium, which proliferation leads to the formation of vegetations. In this same class of lesions may without hesitation be included the subcutaneous fibrous nodules, which, as Drs. Barlow and Warner first pointed out, so closely resemble endocardial vegetations in their structure, and are so often met with in direct association with endocarditis. Indeed, it is quite exceptional for these nodules to be developed in cases in which the endocardium escapes damage, and usually the two processes of endocarditis

and nodule formation advance side by side. Similar localised overgrowths of fibrous tissue are met with in other parts beside the subcutaneous tissues, and Dr. Angel Money has suggested that endocarditis and nodule formation are merely two phases of a far more generalised process, which may involve any of the fibrous structures of the body. As I have already stated, the lesions of the fibrous group are especially apt to occur in children; whereas those of the hyperæmic kind are equally common in adults, and it is owing to this special liability of young subjects to active proliferation of fibrous tissue that the danger of cardiac implication is relatively so much greater in children than in adults.

Obviously, in the present state of our knowledge, the classification of the rheumatic manifestations must of necessity remain incomplete, and, as regards some of them, can hardly be attempted.

In the case of chorea, although we know nothing at present of the nature of the lesion of which it is the symptom, there are certain clinical facts which seem to suggest that this lesion may perhaps be a member of the fibrous group. Chorea is intimately associated with endocarditis, which is often present in choreic cases in which the joints escape entirely; and we occasionally meet with the association of chorea with endocarditis and subcutaneous nodules, also without any attendant arthritis or any history of articular troubles. Like the lesions of the fibrous group, chorea is far commoner in children than in adults, and in girls than in boys. The duration of an attack of chorea has some resemblance to that of the process of nodule formation, for the nodules may develop in successive crops during several months; and lastly, in its a-febrile character, chorea presents a further resemblance to the lesions of the fibrous group. These clinical considerations appear to me to afford sufficient grounds for the hypothesis which was thrown out by Dr. Cheadle in his Harveian Lectures in 1888, that possibly the lesion of which chorea is the symptom is some temporary overgrowth of connective tissue in the nerve-centres.

So far I have spoken only of the primary manifestations of the rheumatic state, but it is necessary to include in our survey of the province of rheumatism certain secondary lesions, which, although they are not directly due to the activity of the rheumatic process, result from the damage which that process inflicts upon the tissues which it involves.

Secondary lesions are sometimes observed even in the course of an attack of acute rheumatism. Emboli, which have become detached from the diseased cardiac valves, may lodge in various

organs and tissues, or the endocarditis may change its character and assume a malignant type. Other secondary effects may result from the pressure exerted by a distended pericardium upon the neighbouring lung. At a later period a patient may apply for treatment on account of a variety of troubles, all dating from an attack of rheumatic fever, and exactly reproducing the distribution of the original lesions, although the active rheumatic process may have come to an end years previously. The obstinate articular pains of which such patients complain are probably due to a simple local inflammatory process in the joints rendered susceptible by the acute attack, just as the lesions of their cardiac valves are the chronic sequelæ of rheumatic endocarditis. There are many eminent authorities who do not accept this view, and who look not only upon simple chronic articular rheumatism, but even upon rheumatoid arthritis as true rheumatic manifestations. The relation of rheumatoid arthritis to rheumatism will be discussed in speaking of that disease, and I will here merely express my belief that those cases in which rheumatoid arthritis develops as a sequel of true rheumatism are merely examples of a general law, that the damage inflicted upon a joint by any form of acute arthritis may lead to dystrophic changes in the articular structures.

There are certain affections which, although they seldom or never appear as accidents of an acute rheumatic attack, are considered by many to be manifestations of the rheumatic diathesis, especially apt to be developed in those who have inherited or have acquired that diathesis. As examples of such affections I may quote lumbago and the so-called rheumatic iritis. These various conditions have been discussed by MM. Besnier and Homolle under the names of "rhumatisme abarticulaire" and "rhumatisme vague." The place to be assigned to such affections presents one of the most difficult problems connected with the study of rheumatism. In some instances the connection with rheumatism is so indefinite and so obscure that its very existence cannot be regarded as clearly established; but in other cases it is difficult to discard entirely the use of terms which have long been employed, and which are supported by such eminent authority. If the relation of some of these lesions to rheumatism be granted, it may be explained in one of two ways—either by supposing that those who are the victims of the rheumatic, or, as some would prefer to say, the arthritic diathesis, have inherited or acquired a certain tissue-state which predisposes them to certain forms of disease, or impresses certain characters upon any morbid process from

which the patients suffer; or by regarding rheumatism as a constitutional malady of life-long duration due to some perversion of nutrition.

The great variety of forms which rheumatism assumes in different cases, and the number of structures which it involves, indicate that it is a systemic disease; and the characteristic distribution of the lesions, their general characters and fundamental resemblances to each other, suggest that it is also a specific malady, resulting from the activity of some distinct and peculiar morbid process. The fact that the rheumatic lesions are such as may result from other causes also, in no way invalidates these conclusions; for we do not question the specific nature of scarlatina because tonsillitis has many causes, and because a scarlatiniform rash is produced by the administration of certain drugs. It has indeed been suggested that any characteristic features which the manifestations of rheumatism exhibit are due rather to some peculiarity of the tissues of the sufferers than to anything specific in the morbid process from which they result, and that in certain individuals any inflammatory process is liable to receive a rheumatic stamp, and is most apt to attack those organs and tissues which are the chosen seats of rheumatism. To this it may be objected that the acquisition or inheritance of the rheumatic diathesis confers no immunity from other forms of inflammatory disease, and that such affections by no means always stop short of suppuration in rheumatic subjects.

Mr. Jonathan Hutchinson classes as arthritic any malady which implicates many joints, or a single joint by recurrent attacks; and under the name of rheumatism he includes all arthritic affections which are not of a gouty nature, that is to say, rheumatic fever, rheumatoid arthritis, and gonorrhœal arthritis. He considers that those who possess the arthritic tendency develop gout under the influence of dietetic causes—rheumatism as the result of exposure. Mr. Hutchinson further holds that gout and rheumatism mix in any proportion; but to those who think that rheumatoid arthritis is an entirely distinct disease from true rheumatism, the occurrence of its characteristic lesions in gouty joints will not appear to afford any evidence of such admixture.

Much may be said in support of the view that rheumatism is a constitutional disease, and it is a well-known fact that persons who have once suffered from rheumatic fever are often liable to a return of slight articular pains as the result of any exposure or chill; but although this character is strongly suggestive of some disorder of nutrition, it can also be traced in other maladies

which are known, or with good reason believed, to belong to the group of infective diseases. Some of these exhibit a like tendency to recur, and may even remain entirely latent for a time, to reawaken into activity under the influence of some fresh stimulus. The manner in which ague, once acquired, impresses some of its characters upon later troubles from which the patient may suffer, either by giving to the temperature-curve an intermittent character, or by introducing neuralgic complications, is familiar to all; and the recurrent attacks of rheumatism, differing so widely in their characters, which are so often observed in children, present certain analogies with the phenomena of syphilis. It cannot, therefore, be contended that the recurrent nature of rheumatism affords any positive proof that it is a disease dependent upon a disorder of nutrition; nor does its hereditary character afford any conclusive evidence of its constitutional nature, for we have in tuberculosis an infective disease, the tendency to which is in the highest degree hereditary.

The supposed relationship of rheumatism to gout is to a great extent based upon the prominent part which arthritis plays in both these maladies, upon the difficulty of the diagnosis between the two in some cases, and upon the hereditary and recurrent characters which both exhibit. There are, moreover, certain points at which the boundaries of gout and rheumatism apparently overlap each other, but it is just at these very points that the limits of each are least defined. On the other hand, rheumatism is a disease of early life, gout of the middle and later periods; the articular lesions constitute a part only of either disease, and the remarkable visceral lesions of rheumatism differ entirely in their characters from those of gout. Between classical monarticular gout and rheumatic fever there is little, even superficial, resemblance. The causation of rheumatism is very different from that of gout, dietetic errors having apparently no share in the production of the former malady; and although both diseases are apt to recur in the same patient, the periodic attacks of gout find no parallel among the phenomena of rheumatism.

It cannot, I think, be questioned that certain affections may occur as the results of either rheumatism or gout; among these are the muscular pains which are usually grouped together under the name of muscular rheumatism, and one is sometimes tempted to take refuge in the use of the epithet arthritic in describing some such cases, in which, from the admixture, either in the family or in the patient, of both maladies, the true origin of the symptoms is rendered very obscure.

If rheumatoid arthritis be not included in the province of rheumatism, there are but few additional arguments which can be brought forward in support of the relationship of gout and rheumatism; and such as can be adduced will appear, to many at least, to be quite insufficient to establish the existence of such a relationship, in face of the mass of evidence which points to their essentially distinct nature. It is, of course, not improbable that in certain individuals the articular structures are peculiarly susceptible to any kind of morbid process, and that any disease which can attack the joints is almost certain to do so in such persons; but the existence of an arthritic diathesis of this limited character implies no relationship between the various maladies which give origin to the articular lesions.

CHAPTER III.

THE PATHOLOGY OF RHEUMATISM.

PART I.—*The Nervous and Chemical Theories.*

No theory yet propounded generally accepted—Points to be explained by any satisfactory theory—Theory of Cullen—The Nervous Theory—Peripheral irritation by cold—What the nervous theory can explain—Objections to it—The Lactic Acid Theory—Failure to detect excess of lactic acid in the system—The evidence that lactic acid is the poison of rheumatism very insufficient—Dr. Richardson's experiments on the production of endocarditis in dogs—Sir W. Foster's observations of arthritis following the medicinal use of lactic acid — Dr. Latham's Neuro-Chemical Theory.

THE question of the true position of rheumatism among morbid processes is indissolubly bound up with that of its pathology, and until the true nature of the disease is made out it cannot receive any final answer. Unfortunately it must be acknowledged that, in spite of the great advances which have been made in the study of the clinical features of rheumatism, and in the alleviation of the suffering which it entails, we still remain almost entirely ignorant of the nature of the morbid process concerned in its production. Not one of the various theories which have been advanced is entirely free from objection, or has as yet met with at all general acceptance.

In framing any theory of the pathology of rheumatism there are many points which have to be considered; such as the varying prevalence of the disease at different periods, and the changes of type which it exhibits from time to time; its comparative independence of seasonal influence, in spite of its so frequent causation by cold; its diathetic character; and the nature of the febrile disturbance. The special liability of certain structures and tissues, and the association together of a number of local manifestations, apparently produced by some specific systemic disturbance, must also be taken into account. Some

of the earlier theories can make no pretence of fulfilling these conditions, being based upon premises which are either erroneous or insufficient, although they represented the sum of the knowledge of the subject at the time when they were propounded.

Cullen's Theory.—Thus, Cullen attributed the articular lesions, which were the only local manifestations of rheumatism with which he was acquainted, to the direct influence of cold upon the joint-structures, which he thought to be especially exposed to this influence by reason of their thinner covering. According to Cullen, the constriction of the articular blood-vessels caused by a chill gives rise to an effort on the part of the circulation to overcome the obstruction so produced; the first and more immediate effect of this effort being the production of local inflammation, and the ultimate result being the general febrile condition.

The Nervous Theory.—An American physician, Dr. J. K. Mitchell, was the first to suggest that rheumatism is due to some lesion of the spinal cord. In support of this theory he quoted cases, some of which, although they cannot be looked upon as examples of rheumatic fever, are of extreme interest from the fact that they are the earliest recorded cases of arthritis resulting from spinal lesions.

The nervous theory has since found powerful advocates in Canstatt, Froriep, Hutchinson, Heyman, and Buzzard. In its most complete form this theory asserts that the local manifestations of rheumatism depend upon a disturbance in the spinal cord or medulla oblongata, in which latter structure is localised the hypothetical centre for the nutrition of the joints. This central disturbance is supposed to result from the irritation of the cutaneous sensory nerve-fibres over a considerable area by exposure or chill. Differences of opinion exist as to the manner in which this peripheral irritation becomes transferred to the nerve-centres, and thence to the nerves which supply the remote organs and tissues. Canstatt considered that vaso-motor disturbance was in itself sufficient for the production of the local lesions, but Heyman, who regarded vaso-motor influence as insufficient to explain the observed phenomena, preferred to attribute the local inflammation to an affection of the nerves which control the nutrition of the affected parts. The nervous theory has in its favour the excessive sweating which is so frequently observed in cases of acute rheumatism, which may, as Dr. Buzzard has pointed out, be attributed to the proximity of the joint-centre to the sweat-centre in the medulla. The probability of the medullary position of the trophic centre for

the joints is further evidenced by the frequency of gastric crises in those cases of locomotor ataxia in which arthropathies are developed. In the same way a similar disturbance of the thermal centre may be invoked as the cause of the hyperpyrexia which is sometimes observed.

It is obvious that, if this be the true explanation of the phenomena of rheumatism, it is no longer possible to regard the malady as specific; for those who hold this view look upon the rheumatic manifestations as merely indirect effects of a chill, which effects Canstatt divided into two main groups, limiting the use of the name "rheumatism" to affections of the fibrous structures, and employing that of "catarrh" for similar affections of the mucous membranes. Mr. Jonathan Hutchinson believes that rheumatic arthritis in its various forms is mainly produced through the nervous system, and is in no way primarily connected with the state of the blood. He adds: "It is, in short, a catarrhal neurosis, the exposure of some tract of skin or mucous membrane to cold or irritation acting as the excitor influence." Such influences, he believes, are most apt to produce articular rheumatism in those who have inherited the arthritic tendency. It must be remembered that cold is by no means the only factor in the causation of rheumatism, and that some at least of the manifestations of the disease have no apparent relation to this cause; and also that the name rheumatism is applied to a group of morbid phenomena intimately associated with each other, and to all appearance due to some distinct and peculiar morbid process. Again, although it is proved that arthritis may result from many lesions of the nervous system, there is little or no evidence that such lesions ever give rise to endocarditis or pericarditis, or, indeed, to any of the other manifestations of the disease. There are, of course, other ways in which the nervous lesions might be produced beside peripheral irritation resulting from a chill, such as the action of a chemical poison or of infective organisms upon the nerve-centres themselves; and theories of the neuro-chemical and neuro-infective kinds have been elaborated by Dr. Latham and Dr. Friedländer respectively. Even if the theory of a nervous origin be rejected, it is not necessary to exclude the nervous system from any share in the causation of the phenomena of rheumatism, and, indeed, there are many indications of the importance of its influence in this respect.

The Lactic Acid Theory.—The idea that rheumatism is due to the presence in the blood of a chemical poison, produced by some perversion of the nutritional processes, has always been received

with much favour, especially in this country. The suggestion that lactic acid was the chemical poison in question was originally thrown out by Prout in a lecture at the College of Physicians, and from that time its claims have found many advocates, among the chief of whom was the late Dr. Fuller.

The views held by many of the advocates of the lactic acid theory may be briefly summed up as follows :—Lactic acid is a product of tissue metamorphosis, which is produced in muscle when it is in a state of activity. This substance may be supposed to be in part oxidised to carbon dioxide and water, and to be in part excreted unaltered by the skin. When the skin over a considerable area is chilled, the excretion of sweat is arrested, and, as a consequence, the elimination of lactic acid is interfered with. This results in the accumulation of lactic acid in the system in especially large quantity if the chill follows upon active muscular exertion. The presence of this excess of lactic acid is the cause of the excessive acidity of the sweat and urine of patients suffering from rheumatic fever. The profuse perspiration is an effort of the system to throw off the poison.

In considering this theory, it must be remembered, in the first place, that lactic acid is a somewhat powerful acid, which cannot exist as such in the blood, unless in chemically excessive quantities, which would render that fluid acid—a condition never found during life. If present, it will be combined with sodium lactate, and as such will be eliminated in the sweat and urine. The evidence that any portion of the lactic acid which is formed in the system is excreted by the skin is insufficient. It is true that Favre detected this substance in the sweat, and confirmed his observation by a combustion analysis of the zinc salt which he obtained ; but other observers have entirely failed to find it, and Salomon states positively that the sweat never contains lactic acid. Moreover, Sir Alfred Garrod and M. Besnier state that excessive acidity is by no means a constant property of rheumatic sweat when freshly excreted upon a clean surface of skin ; and as far as my own observations go, they tend to confirm this statement. M. Bouchard, who leans to a chemical theory, and regards rheumatism as a disease due to a retardation of nutrition, quotes Lépine as having found the blood of a rheumatic patient neutral shortly before death, and Charcot as having found the pericardial fluid acid. He has himself obtained an acid reaction in the fluid from the joints of patients suffering from articular rheumatism.

There is no evidence that any excess of lactic acid is present

in the blood of rheumatic patients. Salomon, who carefully tested the venous blood of six persons suffering from rheumatic fever (employing in each instance as much as one or two cubic centimetres of the fluid) failed entirely to detect even a trace of that substance. It might be objected to these results that the process which must be employed for the detection of lactic acid is an extremely complex one,—that its recognition rests merely upon the crystalline form of the zinc salt, and that its presence might therefore be easily overlooked; but the adequacy of the method is demonstrated, and the importance of Salomon's negative results is enormously increased by the fact that he succeeded in detecting lactic acid in the blood of patients suffering from leucocythæmia. Moreover, several observers have recently shown that a minute quantity of lactic acid is a constant constituent of the blood of certain of the lower animals. It has been urged that the failure to detect lactic acid in the sweat and blood may be due to the instability of this compound; but if this were the case, the same difficulty would be experienced in detecting it in other than rheumatic patients. Even if it be conceded that the retention of lactic acid in the system is the cause of the rheumatic attack, it is, as Drs. Fuller and Maclagan have well pointed out, impossible to believe that the amount so retained owing to a surface chill at the commencement would be sufficient to maintain an acute febrile attack over a period of several weeks, whilst the skin and kidneys are all the while actively engaged in eliminating the product. If lactic acid is in reality the poison of rheumatism, it must be produced in excessive quantities throughout the attack, and not be accumulated, once and for all, at its commencement. That it was so produced was held by Dr. Fuller.

From the above considerations it is evident that many of the arguments upon which the lactic acid theory rests will not bear examination. We have seen that the presence of any excess of this substance in the system is as yet unproved, and that the evidence supplied by physiological chemists points, on the contrary, to the absence of any such excess. It is seen, moreover, that granting the presence of lactic acid, the effect of an initial chill cannot be supposed to be sufficient to account for such excess, nor is there any reason to suppose that it is eliminated in the sweat. Indeed, if the above were the only arguments which could be brought forward in support of the lactic acid theory, it would readily be acknowledged that it rests upon no tangible basis of fact. This is not, however, the only evidence which is forthcoming, for certain observations and experiments

on the effects of the introduction of lactic acid into the system of man and the lower animals seem to prove that its presence is capable of giving rise to some at least of the phenomena of rheumatism. In 1853 Dr. B. W. Richardson made a number of experiments upon dogs, injecting a 10 per cent. solution of lactic acid into their peritoneal cavities. This proceeding led to the development of inflammatory changes in the endocardium, especially of the right heart, as well as to peritonitis, and to slight pericarditis in some instances, and in others to an arthritis of a transitory and shifting character. In one instance the development of a distinct systolic murmur was observed, which disappeared when the animal was allowed to recover. Similar results were obtained by Rauch in 1860. In 1861 there appeared a paper by Reyher, in which he stated his belief, based upon the examination of the hearts of thirty-two dogs upon which no experiments had been performed, that such endocardial changes as Richardson observed are the rule, and not the exception, in these animals. He failed, moreover, to find any difference between the heart of a dog upon which he had repeated Richardson's experiment and those of other dogs which were apparently healthy. Other observers, particularly A. W. and J. Müller, have also thrown doubt upon the accuracy of Richardson's conclusions. Although these observations have naturally deprived the observations of Richardson and Rauch of much of their importance, they do not appear to me to render them so completely valueless as is usually supposed. They do not dispose of the fact that Dr. Richardson not only observed changes in the endocardium after death, but was also able to watch the development of murmurs during the course of his experiments, and obtained in some cases evidence of both pericarditis and arthritis also.

The power of lactic acid, when introduced into the system, to produce acute arthritis, has received confirmation in a remarkable manner. Sir Walter Foster published, in 1871, some remarkable results which he had observed from the administration of lactic acid as a drug in two cases of diabetes. Sir Walter Foster's first patient was a man aged thirty-two, who had never suffered from rheumatism. Lactic acid was administered in fifteen minim doses four times on the first day of the treatment, and on the following day the quantity was doubled. In the course of the second afternoon the patient complained of acute pain in some of his joints and of flying pains in the limbs, and the medicine was, in consequence, dis-

continued. Three days later, when the pains had disappeared, the drug was resumed, and on the following evening the articular pains returned, and next morning the small joints of the fingers, the wrists, and elbows were red, swollen, and painful, presenting an appearance very similar to that of joints affected with acute rheumatism. The cardiac sounds remained clear, the temperature reached 101°, and there was moderate sweating. The medicine was again stopped, and the articular symptoms disappeared in a few days. Twelve days later the drug was resumed, with the full concurrence of the patient, who had felt benefit from it as far as his diabetes was concerned, and preferred to run the risk of the recurrence of arthritis. In a few days the joint troubles returned, and this happened repeatedly until he had suffered from no less than six attacks, in all of which the temperature rose, and in some there was copious diaphoresis. A certain degree of tolerance of the drug appeared to be established after a time, and the patient was able to take considerable quantities with little effect upon the joints. The heart-sounds remained clear throughout. The second case was of a very similar character. A case referred to by Kulz, which is usually quoted in connection with these, is far less important, as the patient merely suffered from so-called rheumatic pains while he was taking lactic acid. Sir Walter Foster considers that in health a much larger quantity of lactic acid than these diabetic patients took would be excreted without causing any perceptible ill effects; and attributes the special intolerance of the drug manifested in the first case to a combination of circumstances, such as deficient activity of the skin, the co-existence of a serious pulmonary complication, as well as to the diabetes itself.

These observations supply the strongest arguments yet brought forward in support of the lactic acid theory of rheumatism, and the repeated relapses which occurred in Sir Walter Foster's patient whenever the use of the drug was resumed, hardly leave room for doubt that the presence of that substance in the system is capable of giving rise to an acute arthritis. If the other arguments had anything like the same force, the truth of the lactic acid theory might be considered as almost proved; and weak as these are, the theory cannot, in face of such results, be lightly dismissed. At the same time, the demonstration that lactic acid is capable of producing phenomena resembling those of rheumatism does not prove that it is the *materies morbi* of that disease, especially as its presence in excess in the blood or excretions of rheumatic patients has not been detected. It is

perhaps worth mentioning, in connection with the observations of Foster and Kulz, that the lactic acid which is supplied as a drug is the product of fermentation; and although its percentage composition, and even its rational formula, are the same as those of sarcolactic acid, which is the supposed rheumatic poison, the two bodies are not chemically identical.

The Neuro-Chemical Theory, which Dr. Latham advanced in his Croonian Lectures of 1886, may be regarded as a modification of the lactic acid theory, for in his explanation of the phenomena of rheumatism this substance plays a very important part. Dr. Latham points out that an exposure to cold is followed by a constriction of the cutaneous vascular areas, and reflexly, through the vaso-motor system, by a corresponding dilatation of the vascular areas of the muscles and viscera. It may be supposed that the hyperæmia so induced in the muscular system is followed by an increased molecular transformation in the substance of the muscles, accompanied by the development of heat, and by an increased formation of the products of muscular metabolism, viz., lactic and glycolic acids. As a result of this process, the available oxygen will be used up, and these products will pass on into the circulation in an unoxidised condition. From the glycocine, uric acid will be formed, and this substance will, under ordinary circumstances, act as a stimulant to the vaso-motor centre, and so lead to a contraction of the blood-vessels in the muscular area, whereby the hyperæmia will be abolished, and a stop will be put to the entire morbid process.

This Dr. Latham believes to be the chemistry of an ordinary feverish cold. He believes, moreover, that uric acid is the actual poison in both rheumatism and gout, but that in the former disease the phenomena are modified by the presence of lactic acid in addition. He holds that in gout the excess of uric acid is formed in the liver, whereas in rheumatism it results from the excessive production of glycocine in the muscular tissues by a process essentially the same as that which goes on in a feverish cold, and the subsequent transformation of this product, first into hydantoin, and ultimately into uric acid, in the liver and spleen. If the patient is in a condition of lowered vitality, either hereditary or acquired, and the vaso-motor centre is, in consequence, enfeebled, it may be supposed that the paralysis of the vaso-motor system will be more complete than it otherwise is, and that the power of recovery under the stimulating influence of uric acid will be lost, and, as a result, the continued stimulation, instead of exciting, would paralyse the

vaso-motor centre, thereby increasing the dilatation of the vessels in the muscular area, and so giving rise to a still further development of heat, and to an increased formation of glycocine and lactic acid. The effect of this will be an accumulation of uric acid in the system, and the lactic acid, which is formed at the same time, will cause a dilatation of the smaller arteries, and will stimulate the sweat-centre, thus aiding its own elimination by the skin.

It may be further supposed that the stimulation of the paralysed vaso-motor centre, or that part of it which controls the vessels of the muscular area, may occasionally give rise to such complete disintegration of the tissues that the temperature becomes raised to a hyperpyrexial degree. Dr. Latham attributes the occurrence of arthritis in rheumatism to a similar mechanism to that which, according to him, gives rise to the articular lesions of gout, namely, an impairment of the nutrition of the joints, resulting from the action of the accumulated uric acid upon the nerve-centres which control their nutrition; and he believes that in rheumatism this effect is increased by the presence of lactic acid, which causes dilatation of the arterioles, particularly those of the cutaneous areas. The tonsillitis which so often precedes the rheumatic attack he explains by supposing that both lesions result from the action of the same chill upon an abnormal nervous system, or else that the continued irritation of the sensory nerves of the inflamed tonsils causes exhaustion of some portion of the vaso-motor centre, and that the uric acid, which is always formed in excess during an attack of quinsy, gives rise to the usual articular lesions of rheumatism, by acting still further upon the already enfeebled centre. Lastly, Dr. Latham offers an explanation of the shifting character of the rheumatic lesions which is based upon the complex nature of the vaso-motor centre. This complexity allows of the paralysis of a portion of the centre which regulates the vessels of one particular area, whilst other portions are merely stimulated to increased activity. The result of this will be that the contraction of the vessels of certain areas will lead to an increased flow of blood to those which are dilated, in consequence of the paralysis of their controlling centre. If the irritation be maintained until stimulation gives place to exhaustion, other portions of the centre will become paralysed, and the vessels of the areas which they control will dilate, and, as a consequence, some portion of the excessive blood supply will be diverted from the original seats of inflammation. This will lead to an amelioration

of their condition, while the newly affected areas will suffer in their turn. This beautiful theory, which Dr. Latham builds up step by step upon the results of physiological experiment, clinical observation, and chemical research, constitutes a great advance upon the old lactic acid theory; by no means the least of its advantages being, that it allows for the continued formation of the morbid product as long as the attack lasts—a provision which, as we have seen, is wanting in the purely chemical theory, except that form of it held by Dr. Fuller, who believed that the lactic acid was a product of mal-assimilation. However, all the negative evidence, which tends to show that there is no accumulation of lactic acid in the system of rheumatic patients, is equally opposed to this theory; and against it is this additional fact, that uric acid, the detection of which is no very hard matter, has never been found in excess, although it has been carefully sought for, in the blood of those who suffer from rheumatism. For the present, it can only be regarded as a hypothetical exposition of the mode in which the phenomena of rheumatism may perhaps be produced, for there is no direct evidence to show that this is the way in which they actually are produced.

The special favour with which the chemical theory of rheumatism has been regarded is to a large extent due to the prevalent notion that rheumatism and gout are closely related to each other; and as gout is looked upon by many as the type of a chemical disease, any theory which assigns a like causation to rheumatism must necessarily commend itself to those who hold this view.

Dr. Haig, whose researches upon uric acid are well known, has recently contended that possibly uric acid is the actual *materies morbi* of rheumatism as well as of gout. He argues from the curative action of sodium salicylate in both these diseases, which he attributes to its power of eliminating uric acid; upon the occurrence in rheumatic subjects of certain minor troubles which he attributes to uric acid; and upon the frequency with which rheumatism develops as a sequela of certain febrile disorders, such as scarlatina and tonsillitis, which lead to a diminution of the alkalinity of the blood.

Many objections present themselves to such a theory of acute rheumatism, which appears to me to attach undue importance to the articular troubles, whilst offering no explanation of the occurrence of the cardiac and other visceral lesions of rheumatism. Again, we have the fact that uric acid has not been found in the blood of rheumatic patients, which Dr. Haig explains by suppos-

ing that this substance is driven out of the blood into the joints by the high and rising acidity due to the fever; but no deposit of sodium urate is found in the joints. Lastly, it is difficult to believe that the same *materies morbi* is capable of giving rise to two such different disorders as rheumatism and gout.

CHAPTER IV.

THE PATHOLOGY OF RHEUMATISM.

PART II.—*The Infective Theory.*

This theory best explains many of the general characters of the disease—The resemblances of rheumatism and pyæmia—Most of the rheumatic lesions are met with in infective diseases—Arthritis—Endocarditis—Pericarditis—Pleurisy—Pneumonia—Sore throat—The Miasmatic Theory—Its antiquity—Dr. Maclagan's views—M. Bertholon's views—Fetkamp's observations—Objections to the miasmatic theory—Dr. Friedländer's views—The Neuro-Infective Theory—Objections—The Embolic Theory of Hueter—The discovery of micro-organisms in rheumatic cases—Mantle—Wilson—Petrone—Popoff—Klebs—Köster.

THE theory that rheumatism has its origin in the introduction into the system of a micro-organism from without has of late years gained many adherents both in this country and upon the Continent of Europe, and many of the phenomena of the disease are more easily explained on this supposition than upon any other theory which has as yet been propounded.

There are, nevertheless, difficulties in the way of its unqualified acceptance, and until these are removed, or the constant presence in rheumatic cases of a specific micro-organism, which can reproduce the disease by inoculation, is demonstrated, it must remain a mere theory. The infective theory alone offers an explanation of the epidemic prevalence of the disease at certain times, and of the fact that although the malady is usually ascribed to exposure, it is yet comparatively independent of meteorological influences, for these are characters which are common to several infective diseases. Nor are examples wanting of infective maladies which occur in epidemics, although they are not apparently directly communicable from the sick to the healthy: this is the case, for example, with cerebro-spinal fever, and, to a lesser degree, with pneumonia. Edlefsen and Gabbett have both called attention to the resemblance of the annual curve of acute rheumatism to that

of certain maladies of this class, and as an example of an infective disease usually produced by cold, pneumonia may be again quoted, or the condition usually described as a cold in the head. The changes in type which the malady exhibits afford even stronger evidence, for this is a well-recognised character of the infective diseases. In the exanthemata it is well marked, for in such diseases as scarlatina or measles it is common to find mild or severe epidemics and outbreaks, in which some particular manifestation assumes unusual prominence; and the same is equally true of enteric and the other continued fevers. Again, like the infectious diseases, rheumatism is especially apt to attack the young, and in this respect it stands in well-marked contrast both to gout and rheumatoid arthritis, which are especially diseases of later life. To the importance of hereditary tendency as a predisposing cause of tubercular disease I have already referred, and this tendency is not apparently without influence, even in the causation of the infectious fevers, although it is to a great extent masked by the ease with which these maladies are transmitted from one individual to another. For example, members of particular families exhibit an immunity against the attacks of scarlet fever which is in striking contrast to the facility with which others succumb to the infection. Again, the liability of those who have once suffered to renewed attacks, which is so prominent a feature of rheumatic fever, can be paralleled in the case of pneumonia, as well as in other infective diseases, such as ague, which do not confer any degree of immunity.

In speaking of the above general features of the rheumatic process, and the analogies which they present with those of infective maladies, I have gone for my examples to members of the various groups of these diseases in turn; but rheumatism presents very striking differences from the members of each group, and if it be an infective disorder, it is one *sui generis*, and not referable either to the category of specific fevers or miasmatic diseases. From the infectious fevers it is differentiated by the absence of direct communicability, by the irregular course of the temperature-curve, and by the prolonged period over which its manifestations extend; whilst the prominent part which is played by the local inflammatory lesions supplies an important distinction from the miasmatic group.

There is, however, one infective disease which exhibits very striking resemblances to rheumatism. Pyæmia, like rheumatism, gives rise to a number of local inflammatory lesions, which, although they differ in their essential character from those of

rheumatism, almost exactly copy their distribution; nor does it seem to me that the significance of this latter fact is lessened by the inherent tendency to suppuration of the pyæmic lesions, and the absence of any such tendency in those of rheumatism. Pyæmia is the only disease besides rheumatism which produces at the same time arthritis, endocarditis, pericarditis, pleurisy, and pneumonia, a fact which has at least some importance in that it demonstrates that these lesions may one and all result from an infective process. To me, at least, the remarkable analogies which exist between rheumatism and pyæmia constitute the strongest argument which has yet been brought forward in support of the infective theory of the former disease. In neither does the fever run a definite course, and in their earlier stages they may resemble each other so closely in their clinical aspect that the diagnosis between them may be well nigh impossible.

Arthritis is by no means uncommon in connection with other infective diseases besides pyæmia, although in some of these it may perhaps have a secondary septic origin. It is frequently developed in the course of an attack of gonorrhœa or dysentery, and less commonly in connection with the various infectious fevers. These symptomatic articular inflammations, which have usually been styled secondary rheumatism, but which have, for the most part, no relation to true rheumatism, have been carefully studied of late years by a number of French physicians. It is interesting to observe that in many of these forms of infective arthritis there is as complete an absence of any tendency to suppuration as in rheumatism itself.

Little is known of any forms of endocarditis except the rheumatic and the septic. There are, of course, many observers, whose opinion is entitled to the greatest respect, who call in question the rheumatic origin of the endocarditis of chorea; but, with this exception, the diseases, other than rheumatism, in the course of which endocarditis occurs are all of undoubtedly infective nature. It matters little, in this connection, what view is taken of the nature of the endocarditis which accompanies scarlatina, for if, as some think, this is not a rheumatic lesion, it is of scarlatinal origin, and therefore infective. M. Jaccoud has come to the conclusion that endocarditis is only produced by the action of micro-organisms, and from this he is led to the conclusion that rheumatism, which is by far the commonest cause of endocarditis, is an infective disease.

Pericarditis is another lesion which is not infrequently of infective origin, although that it is not by any means exclusively

of this nature is shown by its so frequent association with renal disease. Another argument in favour of the infective theory is afforded by the frequent occurrence of sore throat as one of the earliest symptoms of the rheumatic attack; for tonsillitis is so conspicuous a feature in several of the specific fevers, that an analogy with these is necessarily suggested to the mind. Dr. Mantle lays much stress upon this point in his paper on the ætiology of rheumatism, and although it is probable that in some instances the rheumatic symptoms are in reality complications of the throat affection, there is, as I shall endeavour to show in a later chapter, good reason for believing that both pharyngitis and tonsillitis may occur as actual manifestations of rheumatism.

If scarlatinal rheumatism is true rheumatism, it must be acknowledged that it is not easy to explain the frequent association of two distinct infective diseases; but if it is not rheumatism, we have in scarlatina an example of another infective disease besides pyæmia, in which, as in pyæmia, a number of the rheumatic lesions are reproduced.

Both pleurisy and pneumonia are, like the lesions already discussed, apt to occur in connection with infective diseases, and they also must have a place assigned to them among the phenomena of rheumatism. The various kinds of erythema have been compared to the rashes of the specific fevers, but closer analogies are presented by erysipelas, and the erythematous eruptions which occur in connection with cholera.

There are no doubt certain rheumatic lesions which cannot be clearly paralleled among the diseases of the infective group, but these are for the most part due to that active proliferation of fibrous tissue which is so characteristic of rheumatism, and one at least of them, namely, subcutaneous nodule formation, is very likely pathognomonic of the rheumatic state.

In the preceding paragraphs I have merely endeavoured to show that the lesions which go to make up the clinical picture of rheumatism are for the most part such as are met with in infective diseases, and by no means intend to imply that the rheumatic lesions are necessarily of this nature. The remarkable cases in which women who are suffering from rheumatic fever have given birth to children who have shortly developed like symptoms, afford yet another argument in support of the infective theory. Some recent authors, especially Dr. Maclagan in this country, and M. Bertholon in France, have maintained that the nearest allies of rheumatism are to be found in the miasmatic

diseases, and have ably supported their view in their writings upon the subject.

Although it has only recently received much attention, the miasmatic theory is at least as old as the present century. Dr. William Saunders of London, writing to Haygarth in the year 1809, said: "With respect to your inquiries on the subject of acute rheumatism, I am assured by much experience and accurate observation that, with all its inflammatory symptoms, it is an ague in disguise." And Haygarth, who so strongly advocated the treatment with cinchona bark, writes: "From so many circumstances of similarity between the ague and rheumatic fevers, both as to their symptoms and their remedies, some have supposed them to be the same disease." The reasons which lead Dr. Maclagan to support the malarial theory of rheumatism are the following: That both malarial diseases and rheumatism are apt to occur in low-lying damp localities, in certain climates, and at certain seasons; that these diseases do not attack all alike; that they have no definite period of incubation; that they are variable in type, and are apt to recur in the same subject; that they may partially reawaken under the influence of slight causes; that they are not communicable from the sick to the healthy; that their course, unless arrested, is apt to be long; and that just as malarial diseases yield to quinine, so rheumatism yields to salicine. Dr. Maclagan divides the cases of rheumatic fever, according to differences which are observed in the character of the febrile disturbance, into those of a remittent and an intermittent type, in the former of which the ordinary acute cases are included, whereas those of the intermittent type are, as a rule, subacute throughout. Dr. Maclagan holds that rheumatism is essentially a disease of the fibrous tissues, and he regards these tissues as the nidus in which the specific organism undergoes its development. He assigns to lactic acid an important *rôle* in the production of the outward manifestations, and attributes its presence in excess in the system to the effects of the inflammation of the tissues of the motor apparatus, or possibly to the destructive disintegration of the micro-organism itself.

The hereditary rheumatic tendency is ascribed by Dr. Maclagan to the presence in the tissues, of those individuals who are specially predisposed to this disease, of a second factor which is essential for its production. This second factor he localises in the fibrous tissues of the locomotor and vasculo-motor apparatus, and to this localisation attributes the peculiar distribution of the rheumatic lesions. Moreover, the rapid transference of

the inflammatory process from joint to joint is explained by him as the consequence of the exhaustion and rapid renewal of the second factor. The limits of space will not permit me to follow Dr. Maclagan further through the various lines of reasoning by which he so ably supports the theory which he advocates; and for these I must refer my readers to the pages of his book. Dr. Maclagan expressly states that he does not in any way assert the identity of ague and rheumatism, but that he regards them as members of the same morbid group, although as distinct from one another as any two specific fevers.

The arguments which lead M. Bertholon to adopt the miasmatic theory are derived from his studies of the distribution of rheumatism and ague upon the earth's surface, and their relative prevalence in different localities among natives of a region, and those who have moved into it from other places. He finds that among the natives of places in which the climatic conditions favour the development of malarial diseases rheumatic affections are also prevalent, and that both classes of disorders increase in severity from the poles to the equator. Migration from a warmer to a colder zone perhaps increases the frequency, but not the severity, of rheumatic affections, and at the same time decreases the severity of malarial affections. Migration to a warmer zone increases the frequency and severity of rheumatism among the immigrants, provided that the region is not malarial; whereas if the region is malarial, the immigrants are no longer liable to rheumatism, but acquire instead malarial diseases. M. Bertholon attributes the immunity from ague enjoyed by the natives of malarial regions to their tendency to contract rheumatism rather than ague, under conditions which would rather tend to cause ague in an immigrant. Bertholon's views as to the mutual substitution of rheumatism and ague receive support from some remarkable observations of Fetkamp. In his paper, to which I shall frequently have occasion to recur, Fetkamp presents a very striking diagram, in which he illustrates by means of curves the relative frequency of rheumatic fever and malarial diseases in Amsterdam between the years 1875 and 1885. The numbers were as follows:—

Year.	Number of Malarial Cases.	Cases of Rheumatic Fever, Acute and Subacute.	Year.	Number of Malarial Cases.	Cases of Rheumatic Fever, Acute and Subacute.
1875	11	23	1881	23	20
1876	14	9	1882	9	31
1877	31	6	1883	11	42
1878	40	10	1884	10	43
1879	41	11	1885	14	44
1880	33	11			

It will be seen that during this period there was a strictly inverse proportion between the two, rheumatism becoming more prevalent as the frequency of ague declined, and *vice versâ*.

There are, however, considerable difficulties in the way of regarding rheumatism as a malarial disease, and some of the resemblances set out by Dr. Maclagan are of so negative a character that they have but little force. The fever-curve of rheumatism does not exhibit those remarkable periodic variations which are so characteristic of malarial diseases, and the local inflammatory lesions which constitute the most prominent features of rheumatism find no parallel among the phenomena of ague. Dr. Maclagan is therefore compelled to bring forward the local accidents of the infectious fevers in support of the infective origin of those of rheumatism.

Friedländer's Theory.—Dr. Friedländer believes that the articular lesions are merely the peripheral manifestations of a lesion of the central nervous system, which causes irritation of a joint-centre in the medulla, which he localises near the nuclei of the vagus and glosso-pharyngeal nerves. That the centre is situated as high as this he infers from the fact that all joints are liable to be attacked in the course of rheumatic fever, and that the centre is near that of the pneumogastric he concludes from the so frequent occurrence of cardiac affections. Dr. Friedländer goes on to state that this medullary localisation receives support from the relation to rheumatism of a number of diseases which he regards as medullary, such as Landry's paralysis, acute bulbar paralysis, exophthalmic goitre, tetany, diabetes insipidus and mellitus. All these diverse affections he groups together with articular rheumatism as manifestations of one great disease, having its origin in a medullary lesion, which he calls central rheumatism. This observer holds that the normal course of central rheumatism is unattended by any inflammatory lesions, but that such complications may arise as the results of the ordinary causes of inflammation upon the parts of which the innervation is disordered. Lastly, he attributes the medullary lesion itself to a specific micro-organism, and his theory must therefore have a place in the infective group. The arguments brought forward by Dr. Friedländer in support of these startling propositions can hardly be regarded as very cogent, and it would require much more conclusive proofs to convince the profession that the morbid states above enumerated all own one common pathological cause.

Embolic Theory.—Hueter suggested that the micro-organisms, on entering the system, first attacked the endocardium, and that

the endocarditis so produced was the primary cause of the articular and other lesions; but he admitted that these might be due to the direct action of the microbes. The embolic origin of the articular lesions would involve the presence, in all cases, of an antecedent endocarditis, which cannot be admitted, and (as Senator points out) the diversion of the emboli from their more common destinations in the spleen and kidneys.

Bacteriological Researches.—Some observers have discovered micro-organisms in the blood and synovial fluids of rheumatic patients, as well as in the inflamed pericardium and the endocardial vegetations; but results of this kind must be accepted with some reserve, for bacteriological investigations are surrounded with great difficulties, and are rendered doubly hard in this instance by the necessity of selecting undoubted cases of rheumatism, and by the possibility of mistaking inoculated pyæmia in animals for rheumatic attacks. It is, for instance, impossible to admit as evidence the case recorded by Dr. Paul Guttmann, who obtained pure cultures of Staphylococcus aureus from the articular and pericardial fluids of a patient, in face of the facts, which he distinctly states, that the pericardium contained pus, and that numerous abscesses were found in the kidneys. Again, although some of the cases in which Dr. Mantle detected micro-organisms were undoubted examples of rheumatic fever, the fact that he found similar organisms in cases of gonorrhœal and rheumatoid arthritis will be sufficient, in the eyes of many, to show that the organisms which he described could hardly have been the specific germs of rheumatism. The observations of Dr. J. N. Popoff have not yet been reported in sufficient detail to carry conviction, and his complete paper must be awaited before any judgment can be formed upon them. Dr. Popoff inoculated peptone bouillon with the blood of a rheumatic fever patient, and succeeded in obtaining cultivations of micrococci which stained readily with gentian-violet. These organisms he injected into the jugular veins of rabbits, with the result that the animals were attacked with arthritis, pericarditis, and endocarditis, and in their blood, synovia, and hearts similar micrococci were found.

Perhaps the most important observations of this kind yet made are those which relate to endocarditis. Professor Klebs has detected micro-organisms in cases of rheumatic endocarditis, which he describes as differing from those observed in the malignant form; and speaking of these results and those of Köster, Dr. Osler says in his Gulstonian Lectures of 1885 :—

"The constant presence of micro-organisms (in endocarditis)

seems undoubted; only in the simple acute form, we need more complete observations with our improved methods.

"Some good observers have not been able to find them, others declare them to be invariable constituents of the verrucose outgrowths. The careful application of such a satisfactory method of staining as recommended by Gramm should readily determine this question."

It is obvious that if it can be established that rheumatic endocarditis is always associated with micro-organisms, the similar origin of the whole series of rheumatic events can hardly be called in question, and it is this which has led M. Jaccoud to accept the infective theory. Dr. Wilson of Edinburgh has found bacilli in two cases of rheumatic pericarditis. These bacilli were well brought out by staining with fuchsin. He found by cultivation-experiments that the growth and multiplication of the bacilli were arrested both by solutions of sodium salicylate and of sulphate of quinine, but that quinine was the more potent of the two, a stronger solution of the salicylate being required to bring about the same result. Dr. Petrone has described observations of the articular fluid obtained from two cases of rheumatic fever. In this fluid he found micro-organisms which answered exactly to the description given by Klebs of the monads which he discovered in cases of rheumatic endocarditis.

Time alone can show whether or no any of the above-mentioned observers have succeeded in discovering a micro-organism which is the actual specific cause of the phenomena of rheumatism. Until then, we can only rely safely upon the results of clinical study, which seem to indicate that, in spite of the difficulties presented by the apparently constitutional nature of the malady, no theory of the pathology of rheumatism which has as yet been advanced makes so good a show of explaining the peculiarities and variations in the prevalence and type of rheumatic attacks, or accounts so satisfactorily for the peculiar distribution of the local lesions of the disease, as does that which attributes them to an infection from without.

CHAPTER V.

THE ÆTIOLOGY OF RHEUMATISM.

PART I.—*The Influences which Control the Prevalence of Rheumatic Fever.*

Discrepancies in statistics — Mean temperature — Fluctuations of temperature—Rainfall — Conflicting observations as to these factors — Storm-centres — The geographical distribution of acute rheumatism — Scanty data — Epidemics of rheumatic fever—Lange's observations—Variations in the characters of the attacks at different times—Evidence of infection insufficient—House epidemics —Edlefsen's observations—Conclusions.

IN studying the ætiology of rheumatism, two entirely distinct questions have to be considered, namely, what are the influences which control the prevalence of the disease? and what are the predisposing and exciting causes of the individual attack? Unfortunately, as regards the first of these questions, such information as is available deals only with acute articular rheumatism or rheumatic fever, and consequently it will be necessary to confine our attention to this particular form.

That rheumatic fever exhibits very different degrees of prevalence from time to time has been demonstrated by carefully prepared statistics, and the fact can be verified by a reference to the reports of any hospital; but what it is that determines these variations is extremely difficult to ascertain. The onset of an attack of acute rheumatism is so often attributed to cold and damp, that it has usually been assumed that seasonal influences, and changes in the temperature and degree of moisture of the atmosphere, are the most important factors in determining the prevalence of the disease. On the other hand, there have long been observers who have maintained that too great stress has been laid upon the importance of cold and damp as causes of rheumatism, and this opinion gains considerable support from the comparison of statistics. When the results obtained in

various parts of Europe, and even by different observers in the same locality, are compared together, the widest discrepancies are revealed, and the conclusion becomes irresistible that, besides meteorological changes, there are other and far more potent influences at work of the nature of which at present we know little or nothing. The published statistics bearing upon these questions are of very unequal value. Some of them, although the number of cases dealt with is large, cover but a very few years; and others, although based upon observations extending over long periods, embrace so few cases that the numbers for individual years are very small. If the variations in the prevalence of acute rheumatism were simply dependent upon atmospheric conditions, we should expect the annual curve to conform more or less closely to a definite type; but this is not the case, and the statistics show that not only is there a complete want of agreement between the results obtained by different observers, but also that, in individual tables, the prevalence of acute rheumatism stands in no direct relation to the mean monthly temperature, although the majority of observers place the maximum frequency of rheumatism in the winter months.

Statistics of the Prevalence of Rheumatic Fever in the Different Months.

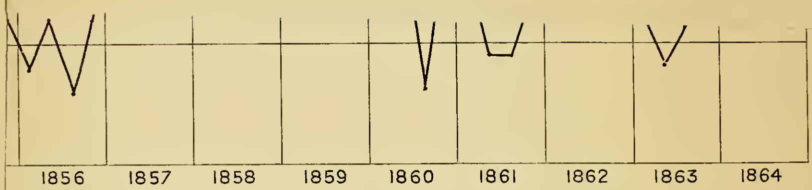
Months.	Besnier, Paris, 8631 Cases, 4 Years.	Lange, Copenhagen, 1838 Cases, 16 Years.	Gabbett, London, 2000 Cases, 9 Years.	Edlefsen, Kiel, 775 Cases, 24 Years.	Fiedler, Dresden, 651 Cases, 13 Years.	Syers, London, 422 Cases, 6 Years.	Thoresen, Eidesvold, 277 Cases, 25 Years.	Lebert, Zurich, 220 Cases, 7 Years.	Hirsch, Wurzburg, 454 Cases, 9 Years.
January . . .	593	205	165	83	64	47	39	21	58
February . .	669	177	132	47	53	46	21	19	46
March . . .	666	156	122	70	60	38	21	20	55
April	781	174	127	72	51	29	19	30	33
May	751	187	130	79	69	26	22	20	33
June	797	152	156	71	58	24	29	21	46
July	861	137	171	56	36	23	18	15	27
August . . .	729	148	159	51	36	40	21	12	21
September . .	661	81	174	54	37	42	19	17	21
October . . .	701	128	215	57	48	47	15	13	29
November . .	701	157	248	59	65	24	24	17	46
December . .	721	186	201	76	74	36	29	15	39

Temperature.—Edlefsen shows, from observations carried out at Kiel, that such diseases as bronchitis and laryngitis, which are directly attributable to cold, steadily decrease from winter to summer, and again increase with the same regularity as the mean tem-

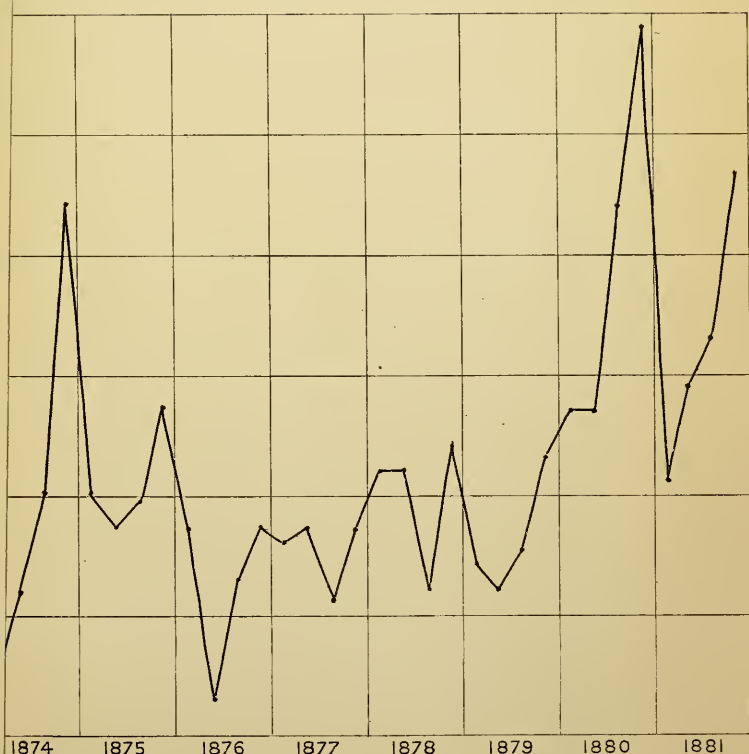
perature falls in the latter part of the year. On the other hand, the rheumatism-curve presents no such regularity, but bears a certain resemblance to that of pneumonia, a disease which is, like rheumatism, usually provoked by exposure, but is not directly dependent upon seasonal influences. From the study of the records of 8631 cases of rheumatic fever admitted to the various hospitals of Paris, M. Besnier arrived at the conclusion that the greatest prevalence of the malady in that city was in the summer months, and placed the maximum in July; but Lange, Edlefsen, and others placed the maximum in January, corresponding with Besnier's minimum. Hirsch was able to trace a relation between the mean monthly temperature and the prevalence of rheumatic fever in Wurzburg, the attacks being most numerous when the mean temperature was below, least numerous when it was above, the average.

A reference to the curve in Chart I., which gives the results obtained by Lange in Copenhagen during a series of years, shows that there was almost always some increase during the winter months, but that these variations were small in comparison with others which were apparently independent of seasonal influences. Rapid changes of temperature are more potent in causing chills than periods of even extreme cold, and it might be supposed that the controlling influence would be traced rather in the fluctuations of temperature than in its mean level; but Edlefsen supplies statistics relating to this point also, and shows that such fluctuations have but little influence in modifying the rheumatism-curve. The disease is no more prevalent in those months in which the temperature undergoes rapid and well-marked changes, than in those in which the range is comparatively slight.

Rainfall.—It has been thought by some that a relation can be traced between the prevalence of rheumatic fever and the rainfall, but here again the observations are at direct variance with each other. Edlefsen found that, contrary to what he expected, the frequency of rheumatic fever in Kiel varied, to some extent, inversely with the rainfall, a period of heavy rain checking rather than encouraging the occurrence of the disease, and similar results were obtained by Hirsch at Wurzburg. Edlefsen states that increased rainfall with relatively high mean temperature is especially potent in this respect, but that the restraining influence of increased rainfall is less when the mean temperature is relatively low, and he suggests that in the winter months exceptional causes come into play which tend to coun-



CURVE CONSTRUCTED FROM GABBETT'S STATISTICS,
RLY ADMISSIONS OF PATIENTS SUFFERING FROM 1ST ATTACKS, TO THE LONDON HOSPITAL,
FROM JAN. 1873 — DEC. 1881.

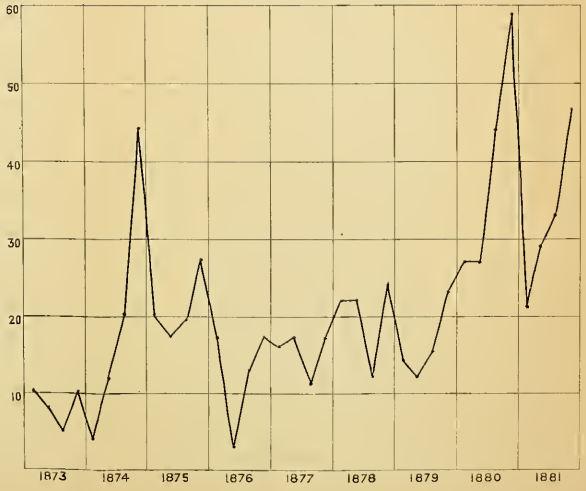


Davidson & C°, Lith.

CHART I.

CURVE CONSTRUCTED FROM LANGE'S STATISTICS,
SHOWING THE QUARTERLY ADMISSIONS OF PATIENTS SUFFERING FROM 1ST ATTACKS OF RHEUMATIC FEVER,
TO THE FREDERIKS HOSPITAL, COPENHAGEN, FROM JAN. 1854 – DEC. 1864.

CURVE CONSTRUCTED FROM GABBETT'S STATISTICS,
SHOWING QUARTERLY ADMISSIONS OF PATIENTS SUFFERING FROM 1ST ATTACKS, TO THE LONDON HOSPITAL,
FROM JAN. 1873 — DEC. 1881.



teract the influence of increased moisture. Hirsch found, on the other hand, that in any particular month the number of cases of rheumatic fever was inversely proportioned both to the mean monthly temperature and the rainfall.

Both observers agree that the fluctuations of the rheumatism-curve follow those of the rainfall-curve, not immediately, but after an interval.

Turning now to the statistics of Gabbett, which were based upon a study of the records of two thousand cases admitted to the London Hospital during a period of nine years, we find them to be completely at variance with those of the German authors. Gabbett states that in London there is, if anything, a tendency for the prevalence of rheumatic fever to vary directly with the rainfall, but the agreement of the two curves was not sufficiently close to establish any certain connection between them. He points out that acute rheumatism is apt to be especially prevalent with such a combination of low temperature and heavy rainfall as is usual in London during the autumn months, and in this statement he is supported by the report of the Collective Investigation Committee of the British Medical Association, which shows that the great majority of cases commence during wet or damp, cold or cloudy weather. Fetkamp, although he was not able to trace any relation between the rainfall and the prevalence of rheumatic fever in Amsterdam, found that on certain days, which he calls "rheumatic days," a number of cases were wont to commence simultaneously in that city, and that on such days there was little or no rain; that they never occurred during periods of continuous and copious rainfall, but that they usually followed some five or ten days after heavy rain. In the face of such conflicting evidence it can hardly be maintained that any clear relation between the prevalence of rheumatic fever and the rainfall has as yet been established.

Storm-Centres.—The researches of Lewis of Philadelphia have introduced an entirely new meteorological factor in this connection. Taking the statistics of the occurrence of chorea and acute rheumatism in Philadelphia during a period of ten years, Lewis constructed, from the monthly totals, yearly curves for the two maladies, which exhibit a remarkable resemblance to each other, but the variations of the rheumatism-curve always followed one month later than the similar variations of the chorea-curve. He found, moreover, that the chorea-curve agreed closely with that obtained from the numbers of storm-centres, which passed within four hundred miles of the city in the same period. It will be

interesting to see whether further observations will confirm this remarkable relationship. The value of the results is somewhat lessened by the fact that the four hundred mile radius was selected, because the curve so obtained agreed most closely with those of chorea and rheumatism, and was not arrived at by an independent line of reasoning; but it is important to note that the curves obtained with other radii also showed a considerable, although not so close, agreement.

Geographical Distribution.—Little is known of the geographical distribution of rheumatism, or of the influence of locality, elevation, and soil upon its prevalence. Besnier was unable to find any satisfactory data bearing upon the distribution of the disease upon the earth's surface, and his ill success was in great measure due to the unsatisfactory manner in which most of the reports bearing upon the subject are drawn up, a variety of affections of different natures being grouped together under the common name of rheumatism. Hirsch found that whilst rheumatism is spread over the entire globe, rheumatic fever is much more localised, being chiefly confined to the temperate zones, and that it is almost unknown in many regions in which chronic articular and muscular rheumatism abound. He suggests, further, that it is not improbable that rheumatic fever is one of the acute specific fevers, and stands to the slighter rheumatic affections in somewhat the same relation as influenza does to ordinary catarrh. Thoresen, speaking from a long experience at Eidesvold, on the Mjösen Lake in Norway, states that the frequency of acute rheumatism decreases in proportion to the height above the lake. He himself had never met with it in places situated more than a hundred and fifty feet above the level of the water, and he found that other practitioners residing in the higher regions in the neighbourhood rarely encountered the disease. Of the cases dealt with in the report of the Collective Investigation Committee, the majority occurred in high, dry, and exposed localities, and of 646 cases in which the necessary data were given, 161 came under this group; whereas

98 occurred in low, damp, confined localities.
52 ,, ,, high and dry localities.
46 ,, ,, low, damp, exposed localities.
35 ,, ,, low and damp localities.
31 ,, ,, high, damp, exposed localities.
31 ,, ,, high and exposed localities.

Epidemic Outbreaks.—In 1866 Lange of Copenhagen, in a paper which has received far less attention than it deserves, endeavoured

to show, as Chomel and Hirsch had already done, that rheumatic fever occurs in epidemic outbreaks, which are independent of meteorological conditions; and if this can be proved to be the case, the discrepancies of the observations as to the influence of weather and seasons will be readily explained, for it is obvious that the occurrence of such an outbreak must necessarily disturb the monthly averages, even when they are derived from a long series of years. Lange based his opinion upon the study of the number of cases of rheumatic fever admitted into the Frederiks Hospital in Copenhagen, from which he ascertained that although the numbers maintained a fairly even level over considerable periods, there were times when the average was very greatly exceeded. Thus, for the seven years 1850 to 1856 inclusive, the numbers showed but trifling variations; but in 1857 there was a marked increase, and a still further rise in the following year, the epidemic reaching its maximum in 1859, when the total of admissions for this cause, which in ordinary years varied between seventy and eighty, reached the high figure of 197. The increase was even more conspicuous when first attacks only were included, and, as Lange points out, it may be supposed that a variety of influences tend to induce a return of the disease in those who have already suffered from it.

A more detailed study of the incidence of the attacks in the several months showed that the epidemic commenced in the early summer of 1857, and terminated somewhat abruptly at the commencement of 1860, so that by the early summer of that year the normal level was again reached.

Similar, although less prolonged, epidemic outbreaks of rheumatic fever are revealed by Gabbett's statistics (see Chart I.). One of these commenced in the latter part of the year 1874, and a careful study of the meteorological records of the time failed to reveal any peculiarity of the weather or temperature to which the increase could be attributed. A second outbreak, which was equally inexplicable on meteorological grounds, commenced in the latter part of the year 1877. It is worthy of note that during the year 1879, which was remarkable on account of its excessive rainfall and low temperature, the admissions for rheumatic fever at the London Hospital were unusually few in number, whereas during the following years, 1880 and 1881, there was another remarkable increase. It is interesting to note that these last were years in which rheumatic fever was especially prevalent at Kiel, where an epidemic, which had begun to make itself felt two or three years earlier, reached its maximum in

1883, in which year Fetkamp noted a remarkable increase of the malady in Amsterdam. Varrentrapp observed similar outbreaks in Frankfort, one of which reached its height in 1865; and in Frankfort, as in Copenhagen and elsewhere, the exceptional prevalence of the malady at certain periods could not be connected with any peculiarity of the weather, nor with any other recognisable external cause. Amongst others who have noticed these epidemics may be mentioned Lebert, who observed one in Zurich in 1857, and De la Harpe, who observed very remarkable variations in the prevalence of rheumatic fever in Lausanne between 1840 and 1846.

Variations of Type.—It is not merely in the great variations of prevalence which it exhibits from time to time, that acute rheumatism resembles the epidemic diseases, but also in the changes which its characters undergo. In some outbreaks the cases are nearly all of an unusually mild type, whereas in others they are far more severe, and each of the various manifestations of the disease has its periods of exceptional prevalence and scarcity. This must be more or less familiar to all who have opportunities of observing cases of rheumatic fever, either in hospital or private practice. In the wards of a hospital it may be noticed that a number of patients admitted one after another, will all have cardiac murmurs, and then may follow a series of cases in which the heart is not affected at all. At one time pericarditis is frequent, at another it is rarely met with; and so with the various other manifestations of rheumatism. Lange has shown that in the great Copenhagen epidemic already referred to, the disease was of an unusually mild type, so much so, that during the year in which the outbreak reached its height, no single death from rheumatic fever occurred, and in this respect this particular year stood alone.

As may be seen by reference to Chart II., the curve of pericarditis and pleurisy, which followed the rheumatism-curve somewhat closely from 1850 to 1856, showed no elevation in 1857, and was only slightly higher than usual in 1858; but from this time it rose rapidly, and was unusually high during the lesser epidemic or epidemics which lasted through the years 1862–64. The number of cerebral cases and of deaths correspond closely, as might be expected; both reached their minimum in 1859, when the great epidemic was at its height, and both rose rapidly during the subsequent minor outbreak. Chorea also, which was not observed in any of the cases in the great epidemic, was unusually common in that of 1862–64. These remarkable results, obtained by so careful an observer as

CHART II.

CURVE CONSTRUCTED FROM LANGE'S STATISTICS.
HOWING THE VARIATIONS IN THE CHARACTERS OF THE DISEASE
AT DIFFERENT PERIODS.

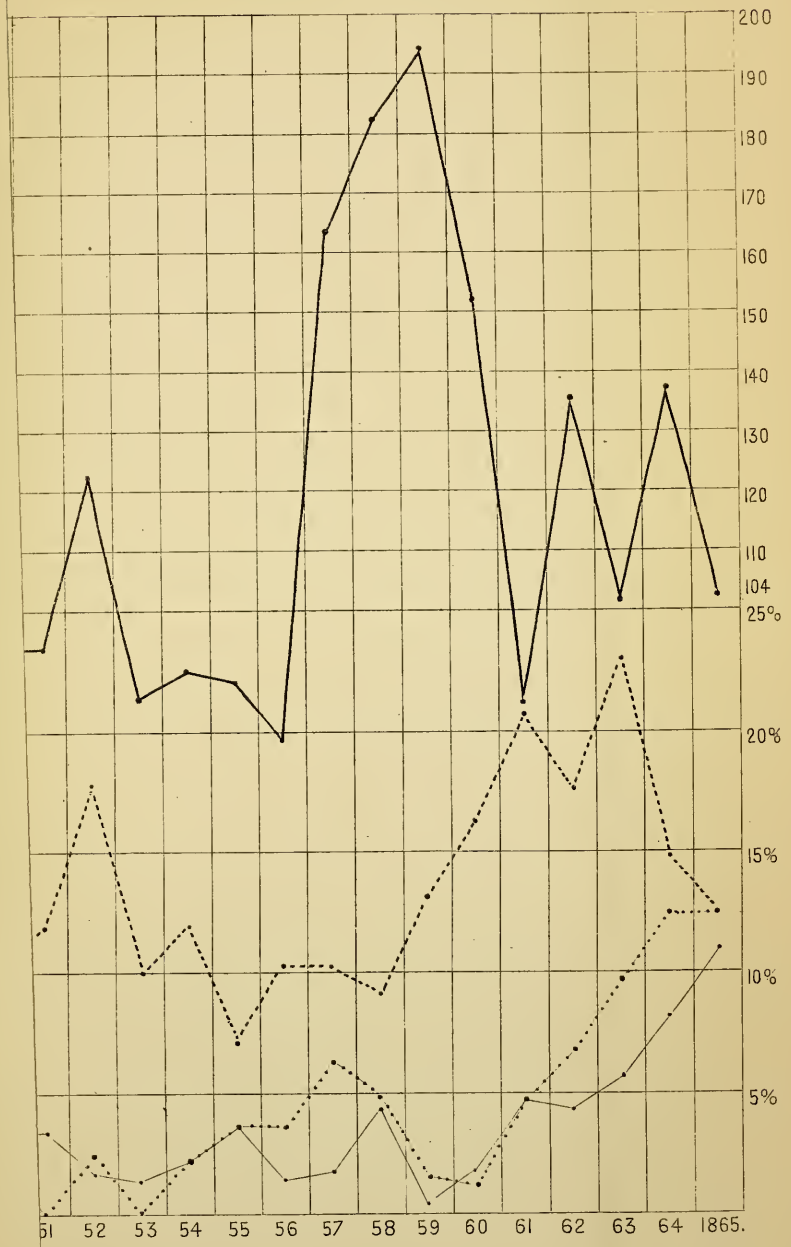


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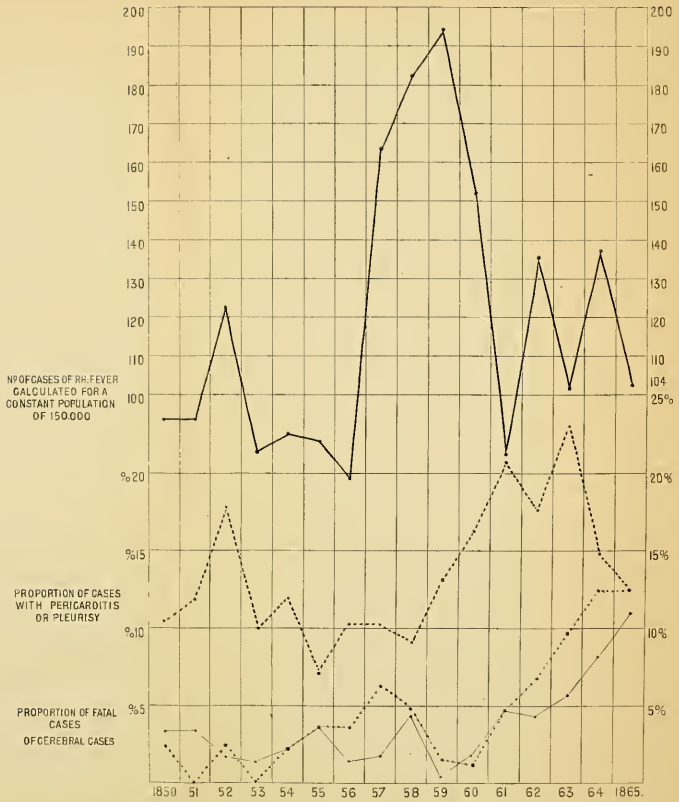
CHART II.

CURVE CONSTRUCTED FROM LANGE'S STATISTICS.
SHOWING THE VARIATIONS IN THE CHARACTERS OF THE DISEASE
AT DIFFERENT PERIODS.



Lange, who even allowed for the error due to the increase of the city by calculating the numbers for a constant population, cannot but be looked upon as of great importance, more especially as they are confirmed by other observers in different localities. Varrentrapp noticed very remarkable variations in the proportion of cases with endocarditis, which did not in any way correspond with the variations in prevalence of rheumatic fever; and Fetkamp states that in Amsterdam the attacks commencing in April, May, and June 1884 were characterised by severe arthritis, but the serous membranes were seldom attacked; whereas in the early part of February and in March of the same year, pericarditis, endocarditis, and pleurisy were common; and in August and September the most striking features were the marked anæmia of the patients, and the frequency with which hæmic murmurs were developed. How greatly the frequency of pericarditis and hyperpyrexia varies is clearly shown in the report of the committee which was appointed by the Clinical Society of London to investigate the subject of hyperpyrexia. Of the cases dealt with by that committee, no less than 81.5 per cent. occurred during the years 1873–77; and although during this period the number of admissions to the Middlesex Hospital for rheumatic fever was above the average, the increase of hyperpyrexia and pericarditis was out of all proportion to that of rheumatism. Since 1877 the number of hyperpyrexial cases has been much smaller, and only one single case of this kind occurred in St. Bartholomew's Hospital during the six years 1881–86, which are covered by Dr. Samuel West's statistics. MM. Besnier and Homolle, and Drs. Andrew, Church, and Donald Hood, have also noticed the variations in the prevalence of such accidents. It may be that the decrease of hyperpyrexia since 1877 is in part due to the change which has taken place in the treatment of rheumatism, consequent upon the introduction of the salicylic drugs, but no such explanation will account for the relative rarity of cerebral cases prior to 1873;[1] and it seems that the salicylates have no power of controlling such abnormal rises of temperature, which may occur even when the patient is fully under the influence of these drugs.

[1] Amongst my father's notes of cases under his care in King's College Hospital, between 1867 and 1873, I find a considerable number of cases of rheumatic hyperpyrexia recorded, and it would seem that during those years it was much less rare than it has lately been in London; but in a paper on this subject by Dr. Andrew, a remarkable series of cases occurring in quick succession in his wards during 1874 is described, and he mentions that during the previous five years he had only had a single case under his care.

Infection.—The chief objection which has been urged against the inclusion of rheumatism amongst epidemic diseases is the absence of any satisfactory evidence of its transmission from one individual to another. It is true that cases have been recorded as examples of such transmission, but it is difficult to believe that infection or contagion has any share in the causation of so common a disease, in face of the overwhelming evidence to the contrary, and many of the instances adduced are far from being conclusive. In investigating such cases, it must be borne in mind that the hereditary character of this disease is so strongly marked, as to render almost worthless arguments based upon its simultaneous occurrence in parent and child, or brother and sister. In a case related by Thoresen, which Fetkamp quotes, a boy aged two and a half years was attacked with rheumatic fever, and soon afterwards his father, who slept in the same bed, developed a similar attack. In this case not only were the patients closely related, but the father had already suffered from rheumatic fever four years previously, and was placed under conditions favourable to the development of a fresh attack, so that Thoresen himself attaches but little importance to it. Dr. Mantle mentions the examples of a father and his two sons, living in a lonely farmhouse, who suffered in succession from rheumatic fever; and of a young lady who was visited during an attack by her lover, who himself developed the disease. Fetkamp describes the case of a woman aged forty-three years, who was admitted to Professor Pel's wards with enteric fever, and who was placed in a bed between those of two patients suffering from acute rheumatism. This woman had never previously exhibited any rheumatic tendencies, and there was no history of rheumatism in her family; nevertheless, seven weeks after her admission to the hospital, she was attacked with rheumatic fever, and at the same time relapses occurred in five other patients under the care of the same physician, amongst whom were the occupants of the neighbouring beds. Fetkamp is inclined to believe that some widespread cosmic-telluric influence was not improbably the cause at work. Cases have been placed on record by Pocock, Schaefer, and others, in which women suffering from rheumatic fever have given birth, during the attack, to children who have almost immediately exhibited symptoms of the same disease; but such examples, important as they are, must be placed in a somewhat different category from those above referred to. Pocock's case was that of a woman, who suffered from an attack of rheumatic fever when eight months pregnant with her second child. Labour pains

came on, and at the same time the rheumatic pains ceased, only to return immediately after the birth of the child. The infant also began to suffer from acute arthritis twelve hours after its birth, with sweating, and a maximum temperature of 104° was recorded; under salicylic treatment these symptoms soon cleared up. The mother's heart was affected, but that of the child escaped. Schaefer's case was of a similar character. The patient, aged thirty-five years, was attacked with rheumatic fever a few days before the termination of her fifth pregnancy. The labour was easy and rapid, and was attended by no appreciable change in the rheumatic symptoms. Three days after the infant's birth some swelling of the dorsum of each of its feet was noticed, and shortly afterwards the joints of the hands became affected, and also the left hip. Neither mother nor child developed any cardiac affection, and it is important to note that the joint-lesions were very obstinate, and were little affected in either case by salicylic treatment, which was ill-borne and had to be abandoned.

Local Outbreaks.—Edlefsen found that, in Kiel, it frequently happened that several cases of rheumatic fever occurred simultaneously, or in rapid succession, in the same house or in neighbouring dwellings. Such "rheumatic houses" were often detached or corner buildings, and were for the most part inhabited by several families. They were not especially those houses which had been recently built, nor did the families inhabiting the basements exhibit any special liability. The character of the subjacent soil appeared to have an important influence, dampness hindering, and relative dryness of the ground favouring, the development of acute rheumatism.

On the other hand, Thoresen stated that, with the exception of the single instance to which reference has been already made, he had not met with a single example of the simultaneous occurrence of two cases of rheumatic fever in the same house; and Fetkamp was unable to detect any tendency to local epidemics in Amsterdam, but suggests that this may be in part due to the relative scarcity of the disease in that city.

Conclusions.—Such being the information which is available, it must be confessed that our knowledge of the influences which control the prevalence of acute rheumatism is still very fragmentary, but, from the evidence which has been brought together in this chapter, certain more or less definite conclusions may be drawn.

First, that although cold and damp are potent exciting causes

of rheumatic attacks, meteorological conditions have no very distinct influence in controlling the prevalence of the disease, which may be unusually great under what would naturally be looked upon as conditions unfavourable to its development, and may reach its minimum during a prolonged period of low mean temperature or heavy rainfall.

Secondly, that from time to time the disease appears with greatly increased frequency, and such epidemic outbreaks are apparently independent of meteorological changes, or other recognisable external influences.

Lastly, that the characters of rheumatism, like those of other epidemic diseases, undergo remarkable variations from time to time, the cases differing not only in severity, but also in the number and character of the structures involved.

It is obvious that these conclusions, if just, have a very important bearing upon the theory of rheumatism, and must be taken into account in framing any hypothesis which attempts to offer a satisfactory account of its pathology.

CHAPTER VI.

THE ÆTIOLOGY OF RHEUMATISM.

PART II.—*The Influences which Determine the Individual Attack.*

Influence of hereditary tendency—Diathesis—Proportion of family histories highest in children—Proportion of rheumatic heredity in non-rheumatic patients—Recurrences—Influence of age—Sex—Occupation—Alcoholism—Lactation—Scarlatina—Exciting causes—Cold and damp—Over-fatigue—Injury—Influences of external and internal causes in determining the form of the attack.

ALL individuals are not equally liable to suffer from rheumatism when placed under conditions favourable to its development, and the exposure or chill which is the exciting cause of an attack of rheumatism in one person, will in another be followed by no evil effects, or will give rise to some disease of an entirely different nature. It is on this account that rheumatism is classed among the diathetic maladies, and in this sense the existence of a rheumatic diathesis cannot be disputed; but this is not the only sense in which the word is used, and some authors go so far as to speak of a diathesis as an extremely chronic disease. If the term is employed at all, it should be understood to imply merely the existence of a certain condition of the tissues which predisposes to the attacks of a certain disease; and since such very different disorders as gout and tubercle are alike, in this sense, diathetic, it is obvious that the possession of this character does not imply that the disease is of a constitutional kind, nor does it afford any evidence of the nature of the morbid process at work.

Mr. Hutchinson speaks of the rheumatic diathesis as universal, and as shared to some extent by all; but against this may be quoted the fact that in some persons the most extreme exposure to the exciting causes of rheumatism appears to be incapable of producing the disease. It is held by some that the rheumatic is merely a division of a basic arthritic diathesis, which Sir Dyce

Duckworth defines as an inherent predisposition, determined by nervous influences affecting the great motor centres, to errors of nutrition of the joints, in virtue of which neuropathic instability the specific peccant matters of each disorder in question work out their mischief. The chief objection to such a view appears to me to be that it lays undue stress upon the articular lesions, both of rheumatism and gout. Whatever constitutes the rheumatic diathesis is transmitted from generation to generation, for there are few diseases in which the influence of heredity is more clearly marked than is the case with rheumatism; yet it is a matter of the greatest difficulty to determine, with any degree of precision, the extent of this influence. This difficulty is in great part due to the want of accuracy in the information which is supplied by the patients, especially by such as are members of the less educated classes.

When the disease under investigation is a well-defined malady, the difficulty is sufficiently great; and when we are dealing with rheumatism, the name of which is applied to almost every kind of ache and pain, the obstacles are such as to make one despair of obtaining any result of the slightest value. Indeed, one is practically compelled to limit one's inquiries to definite attacks of rheumatic fever, a malady which has a distinct place in the popular nosology, and which, on account of its extremely painful character, and the confinement to bed which it involves, leaves a vivid impression upon the minds of those who have suffered from it. The result of this restriction must necessarily be to render the figures far too small, for there are many rheumatic attacks which do not come into this category, and must therefore be left entirely out of account, unless the presence of organic heart-disease confirms the accuracy of the patient's statement.

Again, we cannot expect adults of the lower orders to possess an accurate knowledge of the diseases from which their parents suffered before they were born; and this want of information must itself go far to vitiate all statistics bearing upon the question. Far more satisfactory family histories can usually be obtained when the patients are children, accompanied by their mothers who are able to give an account of at least two generations. It must be borne in mind that even in such cases a negative history does not necessarily exclude an inherited rheumatic tendency, for many persons have suffered from rheumatism in childhood who are quite unaware of the fact, having escaped articular lesions entirely or almost entirely. Against these sources of error, which tend to render the proportion too low, we may set

the inclusion under the name of rheumatic fever of other and distinct forms of articular disease, such as gout or gonorrhœal arthritis, but it is not probable that this at all compensates for the reduction of the totals in other ways.

Heredity.—Dr. Fuller's statistics of 246 cases, treated at St. George's Hospital between January 1845 and May 1848, show that a history of rheumatic fever in one or other parent was obtained in seventy-one cases, or 28.8 per cent. The proportion of such histories was highest amongst the youngest patients, and steadily decreased with each decade of life.

Of the patients under the age of 15 years . .	1 in 1.9	had a rheumatic parent.	
„ „ under the age of 20 years . .	1 in 2.6	„	„
„ „ between the ages of 20 and 30,	1 in 3.5	„	„
„ „ over the age of 30	1 in 6.6	„	„

We should naturally expect that those who inherit a tendency to rheumatism would suffer from the disease at an earlier age than those who have no such hereditary predisposition, and Fuller's observations agree perfectly with what is observed in other hereditary diseases, such as gout and tubercle; yet it is possible that the smaller proportion of family histories amongst older patients is in part due to the increased difficulty in obtaining a reliable family history.

Among five hundred patients treated at the Westminster Hospital, Dr. Syers obtained family histories of rheumatism in the parents, uncles, aunts, brothers, or sisters of 33.4 per cent.; of rheumatic fever in those of 20 per cent., a proportion considerably lower than that given by Fuller. Dr. Pye Smith was able to trace a hereditary tendency in 23 per cent. of his cases. The total number of patients was four hundred; in forty-five there was a history of rheumatic fever, in six others of rheumatism simply, in one or both parents; and in four cases, one or other parent had had heart-disease. The brothers or sisters of twenty-eight patients had had rheumatic fever; and in one instance the mother, grandmother, and sister had so suffered. Turning to the report of the Committee of the Clinical Society on hyperpyrexia, we find it stated that of 1300 patients treated in the Middlesex Hospital, 27 per cent. gave rheumatic family histories. Dr. Cheadle estimates that a child of a rheumatic family is five times as likely to develop rheumatism as one who has no such hereditary tendency. Now it must be remembered, in considering a disease so extremely common as rheumatism, that such histories may be obtained from a large number of patients who

are not themselves rheumatic; and unless we can form some notion of the frequency with which this is the case, we have no means of estimating the importance of heredity as a predisposing cause of the disease. The frequency of rheumatic family histories amongst non-rheumatic patients will depend, to some extent, upon the class of patients from which the statistics are drawn, as well as upon the prevalence of rheumatism in the area in which they reside, and consequently the figures obtained will apply only within such limits. With a view to obtaining some information upon this point, with the help of Dr. Hunt Cooke, I questioned five hundred casualty patients at St. Bartholomew's Hospital, who applied for treatment on account of ailments having no recognised connection with rheumatism, and who stated that they had not themselves suffered from rheumatic fever. Of these patients, 105, or 21 per cent., gave histories of rheumatic fever in their parents, brothers, or sisters, whilst amongst a hundred others who had themselves suffered from rheumatic fever, thirty-five gave similar family histories.[1]

It is not so much from the study of figures, such as those which have been quoted, as by the examination of particular instances that the most satisfactory notion of the importance of heredity as a predisposing cause of rheumatism is obtained. Dr. Goodhart has quoted examples of extremely rheumatic families, and to these I may add the following from my own notes. In one family the mother and all her children, five in number, who had survived the troubles of infancy, had suffered from rheumatic fever; one son had had three attacks, and another five. The various members of the family were attacked in three different houses, situated in two different towns. Even when the children of rheumatic parents are fortunate enough to escape the graver forms of the disease, they frequently suffer from slight articular pains, or exhibit eruptions of urticaria or erythema.

One of the most noticeable features of rheumatism is the frequency with which persons who have once suffered from it experience repeated attacks at greater or less intervals. Some have supposed that the occurrence of one attack predisposes to later ones, and that the rheumatic tendency may be acquired even by those who do not inherit it; others maintain that the first attack is an indication of a special liability, which renders the patient equally apt to fall a victim on any future occasion, when he is again placed under conditions favourable to the development of rheumatism. When, however, we observe the

[1] These results appeared in the *Lancet*, 1888, ii. p. 110.

occurrence in children of a series of rheumatic events, now of one kind, now of another, often separated from each other by hardly any interval, and extending over a long period, the idea suggests itself that rheumatism, like ague or syphilis, is capable of remaining latent for a time, only to be aroused into fresh activity under the influence of some fresh stimulus; in other words, that the patient sometimes continues to suffer from rheumatism although the disease does not manifest its presence by any outward signs.[1]

Age.—The liability to rheumatism is far greater in early than in later life, although no age is altogether exempt from its attacks. The published statistics bearing upon this point necessarily convey a somewhat erroneous impression, because they deal only with cases of acute articular rheumatism, and therefore exclude a large number of cases occurring in children, which do not conform to that type.

The Report of the Collective Investigation Committee of the British Medical Association, drawn up by Dr. Whipham, places the maximum liability to rheumatic fever between the ages of twenty and thirty years; and Fuller also gives the same period. Besnier places the maximum between thirty and forty; Syers between ten and twenty; Samuel West between twenty and thirty (61.4 per cent. of the total between fifteen and thirty); Pye Smith between ten and thirty, and especially between sixteen and twenty-one; Hirsch between sixteen and twenty; and Lebert between sixteen and twenty-five.

Sex.—The influence of sex is somewhat obscure, and in adult life men and women appear to suffer almost equally, the statistics giving the majority, some to one, some to the other sex. Syers gives 197 males to 225 females; Samuel West, 619 males to 518 females; Besnier, 5461 males to 3170 females; Fiedler, 281 males to 370 females; Senator, 678 males to 692 females; Pye Smith, 223 males to 177 females; Hirsch, 227 males to 227 females; and Lebert 119 males to 111 females. The totals of all these figures give 7805 males and 5490 females. In childhood girls appear to suffer from rheumatism in considerably greater numbers than boys. Dr. Cheadle has called attention to the greater liability of girls to almost all the individual manifestations of the disease, and my own observations lead me to think, with him, that not only chorea, but also

[1] This is the idea which is conveyed by the word "diathesis" when employed in its less usual sense, to signify a disposition to the manifestations of a disease, rather than a predisposition to the disease.

subcutaneous nodules, erythema, and rheumatic heart affections, are considerably commoner in female than in male children. It should be mentioned, however, that Hirsch found that rheumatic fever occurred more commonly in boys than in girls under the age of fifteen.

Occupations and Habits.—It is obvious that statistics showing the occupations followed by the patients are of little value, unless the total number of admissions to hospital from each class is also known, in order that the proportion, and not only the numbers, of patients following each occupation who suffer from rheumatic fever may be estimated. The importance of obtaining such information is clearly shown by the statistics of Fiedler, who found that, although the majority of the patients admitted to the Dresden Hospital with rheumatic fever were domestic servants, this class also supplied the greatest number of patients of all kinds, and that the rheumatic cases reached a higher proportion of the total amongst blacksmiths and bakers. Senator, who does not calculate the proportions, states that he has found especially large numbers of coachmen, railway servants, smiths, factory-hands, and cooks amongst his rheumatic fever patients; and the British Medical Association Report assigns the first places to domestic servants, school-children, married women, and labourers. Although some of the above-mentioned occupations involve exposure or great muscular exertion, and others imply work in hot rooms and a consequent risk of chill on coming out into the open air; taken as a whole, the information available on this point does not throw much light upon the ætiology of rheumatism. It is, however, noteworthy that Lebert found that nearly two-thirds of his patients followed occupations which involved frequent changes of temperature or work in the open air. It may be stated generally that any influence which tends to lower the general health may act as a predisposing cause of this as of other maladies. Among such Besnier assigns an important place to alcoholism; but it is certain that alcoholic beverages play a far less important part in the production of rheumatism than of gout; in other words, that rheumatism is not a dietetic disease. The Collective Investigation Report supplies much information upon this question, but the statistics given bear rather upon the effect of alcoholism in modifying the course of rheumatism, than upon its action as a predisposing cause; and although the numbers of teetotallers, temperate, and intemperate persons included amongst the sufferers from rheumatic fever are given, no information is, nor could be, supplied as to the proportion of those

belonging to each group who suffer from the disease. The temperate, who form the largest part of the community, naturally contributed the greatest number of the patients who came under observation.

Lactation.—Lactation appears to have an influence favouring the development of rheumatism, but during this period forms of arthritis, usually monarticular, are often observed, the rheumatic nature of which is at least extremely doubtful. It cannot be doubted that many of those who have discussed the influence of parturition as a predisposing cause of rheumatism have based their opinion upon an erroneous interpretation of cases; for women after childbirth are liable to acute inflammations of many joints, which, although they may closely simulate true articular rheumatism, are in reality of septic origin.

Scarlatina.—Scarlatina holds an important place among the causes of rheumatism; for without entering here upon the vexed question of the nature of the arthritis which is so frequent a complication of scarlatina, it may be pointed out that in many cases the articular lesions bear so strong a resemblance to those of true rheumatism, and are so frequently attended by other rheumatic manifestations, that it is difficult to suppose that they are of any other nature. Occasionally, but rarely, rheumatism occurs as a complication or sequela of other acute fevers besides scarlatina, but the majority of so-called secondary rheumatic affections are probably of entirely different origin, being in some instances pyæmic, and in others actual manifestations of the diseases in connection with which they occur.

Exciting Causes.—It will be seen, then, that several influences combine to determine the incidence of rheumatism upon individual members of the community. In the first place, the probability of the attack will depend, to some extent, upon the prevalence of the malady at particular times. Some succumb because they have inherited a special liability from their parents; others because their occupations involve exposure; others because the state of their health is such that they fall an easy prey to any acute form of disease. There remains still to be considered another factor, namely, exposure to those various conditions which act as direct exciting causes of the attack. Amongst such exciting causes of rheumatism exposure to cold and damp must undoubtedly occupy the first place. The power of these influences in producing rheumatism is attested by the experience of ages, and cannot be gainsaid. This is not incompatible with the fact that meteorological conditions have no very definite effect in modi-

fying the prevalence of the malady; for chills are common in all weathers, and there is reason to believe that a chill taken when the body is heated is especially apt to be followed by rheumatism.

Moreover, certain other diseases, such as pneumonia, of which chill is a potent exciting cause, are no more directly dependent upon seasonal influences. Hirsch estimates the proportion of cases of rheumatic fever due to such causes at 24 per cent., and in the Collective Investigation Report Dr. Whipham states that the attacks were attributed to—

Exposure to wet and cold in .	16.18	per cent. of the cases.
To over-fatigue and exposure in	15.11	,, ,,
To exposure to cold alone in .	13.89	,, ,,
To exposure to wet alone in .	10.68	,, ,,

These figures yield a total percentage of 55.86, which agrees very well with the observations of Lebert, who estimated the proportion of cases due to exposure at 50 per cent. It is very probable that the influence of exposure is somewhat over-estimated, for most of us could at any time explain, by some slight chill, from sitting in a draught, or from getting our feet wet, the onset of an attack of rheumatism, which may in reality have been excited by some quite different but forgotten cause. However this may be, it is certain that other influences besides exposure have an important share in the causation of rheumatism, and amongst these, over-fatigue appears to be one of the most important. Occasionally this appears to act alone as the exciting cause of an attack, but more frequently cold and fatigue are combined. Persons in whom mere exposure is insufficient to excite the disease often readily succumb when the chill follows upon a period of active muscular exertion. Local injury appears to act in some instances as an exciting cause of articular rheumatism. I have myself seen a man, aged thirty-five, who had previously suffered from rheumatic fever, and who, after a slight strain to his right shoulder-joint, developed acute pain and swelling of the part, accompanied by high temperature and profuse sweating. In the case, recorded by Potain, of a woman aged twenty-six, a second attack followed the application of the actual cautery to one of the ankles, which had remained swollen after a previous attack two months earlier. Riegel met with a case of rheumatic fever in which the attack followed a fall upon the left hand, and commenced with arthritis of the left wrist; and Charcot quotes the instance of a patient who had previously given evidence of rheumatic tendencies, and whose attack dated from the

formation of a boil as the result of a prick upon one of his hands. Hirsch also has recorded no less than four cases in which rheumatic fever followed injuries of various kinds; in each of which the injured joint was first attacked. This special tendency of the joint nearest to the seat of injury to become the earliest seat of the rheumatic changes leads us naturally to the consideration of the influence of external and internal causes in modifying the character, as well as in determining the incidence of the disease.

We have already seen that the form which rheumatism assumes is to some extent dependent upon controlling influences of the nature of which we know little or nothing, but some influence is also exerted by recognisable causes in particular cases. Members of certain families exhibit a peculiar liability to certain manifestations of the disease. In some rheumatic families there appears to be a transmitted peculiarity of the nervous system which favours the development of chorea, whilst in others, equally rheumatic, chorea is never met with. In one instance I obtained the following family history:—The patient was a boy whose maternal grandmother and five of her sons were all rheumatic, and the children of one of these sons had suffered from chorea. The patient's mother had escaped, but, of her children, one son had suffered from rheumatic fever and chorea, and had cardiac disease; another (the patient) had had rheumatic fever three times and chorea four times, and also had his heart affected; and a third son had suffered from chorea, but not from rheumatism. The patient's father had also passed through an attack of rheumatic fever, but there was no chorea in his family.

The individual peculiarities of the patient have a no less important influence in moulding the characters of the disease, as is well seen in those cases in which, in spite of a series of attacks of rheumatic fever, the heart entirely escapes, and in those in which the same patient exhibits manifestations of the same kind, such as erythema, chorea, or subcutaneous nodules, in each successive attack of rheumatism. Nor are external causes powerless in this respect. It is well known that the onset of an attack of rheumatic chorea is often directly attributable to a fright; erythema in a rheumatic subject may be traced to a gastric disturbance in some instances; and the danger of cardiac affection is apparently greatly diminished if absolute rest is enjoined at the very commencement of the attack. We may suppose that, in such cases, the conditions favourable to the development of rheumatic lesions being present, the actual form of those lesions is, to some extent, determined by external influences.

CHAPTER VII.

ACUTE AND SUBACUTE ARTICULAR RHEUMATISM OR RHEUMATIC FEVER.

The division into an acute and subacute variety an arbitrary one—Arthritis the leading feature of rheumatic fever—Period of incubation—Modes of onset—Articular symptoms—General symptoms—Temperature curve—Influence of the local lesions upon the temperature curve—Arguments against and for the primary nature of the fever—Absence of typical course—Views of Wunderlich, Southey, and Friedländer—The pulse—Sweating—Urine—Condition of the blood—Absence of tendency to delirium—Synopsis of the rheumatic manifestations—Duration of the attack—Recrudescence and relapse—Mortality—Causes of death in the course of rheumatic fever.

It will be best to begin the study of the clinical features of rheumatism with that of the most typical form of the disease, the so-called rheumatic fever. Cases of rheumatic fever are usually divided into acute and subacute; but this distinction, convenient as it is for clinical purposes, is necessarily somewhat arbitrary, for the two varieties pass insensibly the one into the other, and there is no essential difference between them. It is, therefore, usual to select some standard of fever, such as 100° F., and to call all cases in which that standard is exceeded acute, and those in which it is not reached subacute. Any rheumatic attack is included under the name of "rheumatic fever" in which there is obvious inflammation of joints attended by a rise of temperature, and as the joints are the seats of election of the rheumatic process, the majority of cases are included under this head; but equally acute attacks occur in which the joints escape, and the pericardium or some other internal structure alone suffers, and between these and typical attacks of rheumatic fever there is no essential difference.

When rheumatic fever follows a chill, the interval between this and the commencement of the symptoms varies somewhat, but it is usually not more than a day or two.[1]

[1] I may quote the following examples:—(1.) A patient got wet through, and two days later the joints became stiff. (2.) A patient was chilled after a warm bath; the

The mode of onset of the attack is subject to considerable variety. Occasionally the earliest sign of illness is a rapid elevation of temperature, attended by the usual signs of acute febrile disturbance, and followed, after some hours, by pain in the joints and swelling. More commonly the patient passes through a premonitory stage of illness, during which the symptoms are indistinguishable from those of an ordinary feverish cold; flying pains are felt in the muscles and joints, accompanied by a feeling of malaise; the temperature is, as a rule, but slightly raised at first, and the patient rarely shivers. Many patients complain of some soreness of the throat at this stage, which soreness is usually very transitory, disappearing in most cases before the articular lesions are developed. Under any circumstances the true nature of the illness is sooner or later revealed by the invasion of one or more of the larger joints, and by the development of febrile disturbance, which is to some extent commensurate with the severity of the arthritis. In acute cases the tissues around the affected joints quickly become swollen, and the synovial capsule is distended with effusion; at the same time the skin which covers the articulation may retain its natural appearance, but more commonly it is overspread by an erythematous blush, which may be so well marked as to recall the appearance presented in cases of acute gout. The inflammatory process is not limited to the joint-structures proper, but often extends to the sheaths of the neighbouring tendons, which become distended with fluid. The muscles themselves may also be the seats of great pain and tenderness. In spite of the intensity of the inflammatory process, there is no tendency to suppuration, and the pain and tenderness often disappear as rapidly as they are developed; so that in a few hours, or at any rate in a single night, the joints which seemed to be so profoundly affected will have resumed their natural appearance, whilst others are invaded in turn. The corresponding joints of the two sides of the body are sometimes attacked together or in quick succession, but there is no such distinct tendency to symmetrical invasion as is observed in rheumatoid arthritis. The transitory character of the arthritis, and its rapid shifting from one joint to another, is best seen in the most acute cases; and when the attack is subacute, the articular lesions are, as a rule, fewer in number and more fixed.

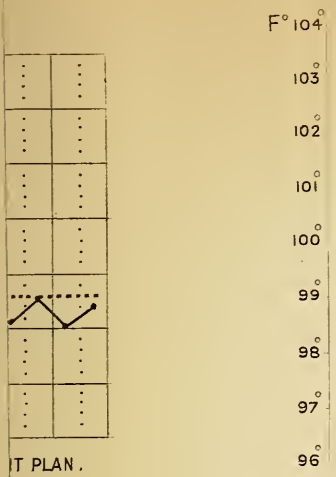
symptoms began in the following week. (3.) Another caught cold when washing clothes; two days later was feverish. (4.) Another slept in a damp bed; next morning felt articular pains.

The pain in the affected joints is greatly aggravated by movement; the patient lies upon his back, unable to stir hand or foot or to turn himself into any fresh position, and the touch of his medical attendant, the pressure of the bed-clothes, and even the slight vibrations caused by passing footsteps, may give rise to intense suffering. The bowels are, as a rule, confined, and the tongue is coated with a moist white fur. The temperature curve conforms to no definite type, and is profoundly modified both by the severity of the arthritis and by the development of such visceral lesions as pericarditis or pneumonia. The curve has a remittent character, the readings varying in severe cases between 101° and 104°, whereas in subacute cases it may be but slightly raised above the normal. (Charts III. and IV.)

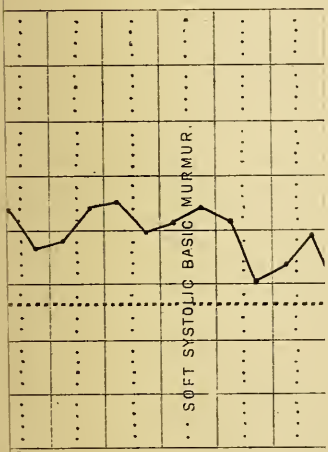
The Fever.—The question whether the fever of acute rheumatism is a primary phenomenon, or is merely secondary to the local lesions, is one of very great interest and importance, but is, at the same time, one to which it is extremely difficult to return a satisfactory answer; for it is only from the presence of the local manifestations that it is possible to be sure of the nature of the attack. Unquestionably the local lesions have a very great power of modifying the temperature curve, but they do not all possess this power in an equal degree; and whereas pericarditis causes a well-marked rise of temperature, and severe arthritis is always attended with fever, endocarditis has very little effect upon the curve. (Chart IV.)

In children the febrile disturbance which accompanies a rheumatic attack is usually much less intense than is the case in adults, and this may be associated with the fact that in children the articular lesions are often trifling or altogether absent. The formation of successive crops of subcutaneous nodules, attended with progressive endocarditis, is often accompanied by no elevation of temperature worth speaking of, although there is every reason to believe that a patient who suffers in this way is the victim of an acute rheumatic process; and if chorea with endocarditis is an expression of rheumatism, we have here another example of rheumatism without any considerable febrile disturbance. It is also suggestive that the most striking effects of the administration of the salicylates to rheumatic patients are the clearing up of the articular lesions, and the simultaneous reduction of the temperature. (Chart III. figs. 3 and 4.)

All these considerations point strongly to a local origin of the febrile disturbance, and seem to show that the elevation of the temperature is directly dependent upon the development of



IT PLAN.



2.
UPON THE EXPECTANT PLAN.

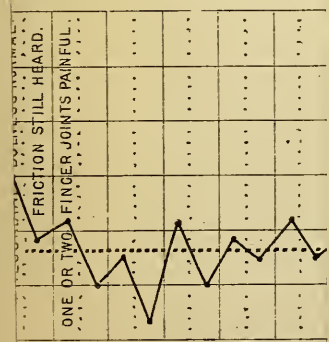


FIG. 5.
RHEUMATIC FEVER TREATED UPO

CHART III.

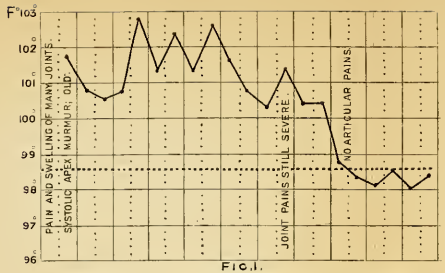


FIG. 1.
RHEUMATIC FEVER TREATED UPON THE EXPECTANT PLAN.

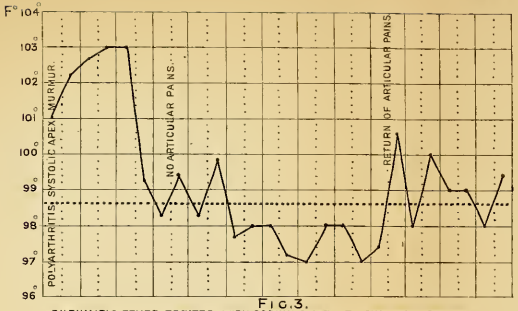


FIG. 3.
RHEUMATIC FEVER TREATED WITH SODIUM SALICYLATE, SHOWING RECRUDESCENCE.

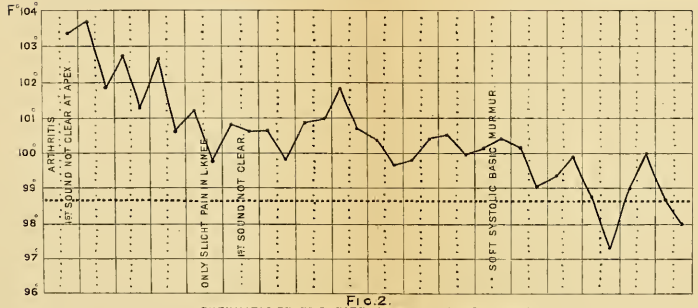


FIG. 2.
RHEUMATIC FEVER TREATED UPON THE EXPECTANT PLAN.

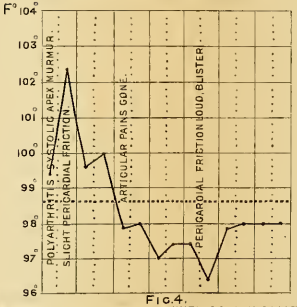


FIG. 4.
RHEUMATIC FEVER TREATED WITH SODIUM SALICYLATE.

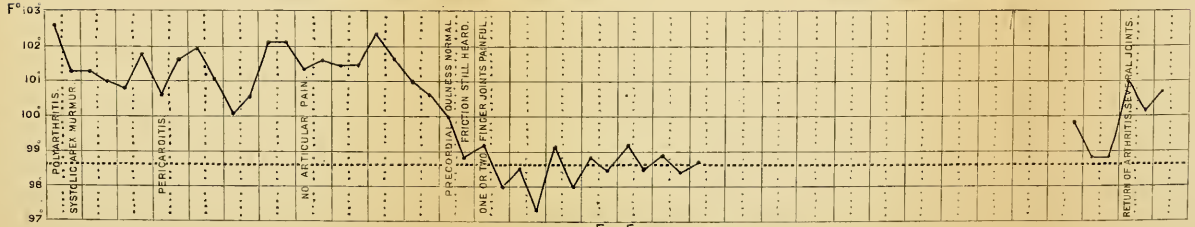


FIG. 5.
RHEUMATIC FEVER TREATED UPON THE EXPECTANT PLAN.

Danielsson & Co., Lith.

arthritis, and of certain other lesions. Nor is it easy to see how they can be reconciled with the idea that the fever is a primary phenomenon of the disease. This local view has found able advocates in Besnier and Homolle; but Charcot speaks far less positively than these authors, concluding that there is in this malady an unknown quantity which escapes accurate measurement, and which would almost seem to justify the opinion of Graves, Todd, and Fuller, who looked upon the febrile disturbance as a primary phenomenon.

In favour of the primary nature of the fever is the well-established fact that a very considerable rise of temperature may precede the appearance of any local manifestations which can be recognised by any means at our command; and that the elevation of temperature is sometimes out of all proportion to the articular lesions, and may continue long after the joints have returned to their normal condition. This is explained by Besnier by supposing that in such cases the fever is due to some undetected visceral inflammation; but this explanation can hardly be regarded as satisfactory when it is considered how few of the visceral lesions, even when well developed, have any material influence in modifying the temperature curve.

There are cases on record in which the diagnosis of rheumatism has been arrived at, apparently upon sufficient grounds, in the absence of any articular or visceral lesions. A case of this kind, which has been frequently quoted, was described by Graves many years ago, and quite recently Dr. Gee has recorded several examples, in one of which the febrile attack occurred as a relapse after acute rheumatism, and in another there was merely transitory arthritis at its commencement. It might be suggested that the severity of the local lesions is merely an index of the intensity of the morbid process, of which the elevation of temperature is also a sign, and that the salicylates, by checking this process, at the same time reduce the temperature and abolish the local manifestations; but if this were the case, these drugs should have as potent an action upon the cardiac lesions as upon the arthritis—should, in a word, have a specific anti-rheumatic action.

If the fever of rheumatism is a primary phenomenon, it is remarkable that it runs no definite course; but if it is of local origin, and an attack of rheumatic fever is merely an acute outbreak of a disease which may have been more or less latent for a considerable time, and does not necessarily come to an end with the termination of the local manifestations, such irregularity is only what is to be expected.

It is true that some observers have thought that they have been able to detect an approach to a typical curve in this malady, but there is little agreement between their results. Wunderlich, after alluding to the great variations exhibited by the temperature curve in different cases, states that "a very considerable number (that is to say, about half the cases of moderate or slight severity, and some of the severe ones also) exhibit a moderate degree of febrile disturbance, the temperature rising gradually at first, reaching its maximum at the end of the first or the beginning of the second week, remaining at this level, or thereabouts, with little or no variation, for a few days only (sometimes for a single evening only), and then, if the patient is well cared for, falling by a gradual lysis with moderate morning remissions. The temperature is somewhat susceptible to external influences, but is apparently little affected by the development of inflammations of internal organs, unless these are very intense. At the same time there is often a want of proportion between the temperature and the pulse frequency, even when there are no cardiac lesions. The course of the fever exhibits no weekly cycle."

Sir W. Gull and Dr. Sutton, from the observation of a series of cases treated with mint-water only, concluded that the average duration of uncomplicated rheumatic fever was nineteen days, and that the average duration of such cases after admission to hospital was nine days. Dr. Southey distinguishes two classes of cases, in which the durations of the febrile disturbance are different, and which he styles respectively the relapsing and continued varieties. He states that relapses are most likely to occur when the initial fever is of short duration, lasting only one or two weeks; that in such cases the onset is, as a rule, gradual, and defervescence sudden, and that there is a special liability to endocarditis. The cases of the continued type, on the other hand, have usually a duration of three or four weeks, a sudden onset and gradual defervescence, and in these pericarditis is especially frequent. Moreover, Dr. Southey believes that it is possible to trace some indications of a weekly cycle, and shows that when his cases were arranged according to the dates at which the temperature first returned to normal, this event was seen to have usually occurred on the seventh, fourteenth, twenty-first, or twenty-eighth day. Later observers have failed to recognise these varieties, and Dr. Church says that neither was he able to foretell the probability of relapse, nor did his cases bear out Southey's views as to the occurrence of critical days in the course of this disease.

Dr. Friedländer, however, has advanced somewhat similar views to those of Southey. He states that acute articular rheumatism is in reality a highly typical disease, both as to its duration, its temperature curve, and its articular localisation. He finds that a large number of the cases last either one week or nearly a fortnight, and that in the course of a short attack of this kind the same joint is never twice affected. He regards the cases which run a longer course as made up of two or more such attacks, and holds that in such composite cases the same joints may suffer more than once. In a single cycle the rise of temperature is gradual, and after the maximum has been reached there is an equally gradual lysis. Friedländer allows that abortive cases are met with in which the fever lasts less than a week, and that the fever often continues to range high after the natural period is reached, in consequence of the development of complications. He bases his opinions upon the study of cases which occurred before the salicylic drugs were employed in the treatment of rheumatic fever, and it is only by comparison with such cases that his conclusions can be verified or disproved, for the alteration in treatment has practically abolished the natural temperature chart of the disease.

Hirsch states that his own observations lead him to an entirely different result from that of Friedländer, and he is convinced that the duration of rheumatic fever is quite irregular; and although some of the charts of cases treated upon the expectant plan, which I have looked over, show some approach to the curves which Friedländer describes, I also have been unable to make out any uniformity.

It would seem, then, that we are not yet in a position to decide positively how far the febrile disturbance which is associated with a rheumatic attack is a primary phenomenon of the disease, or how far it is dependent upon the presence of local lesions. At the same time there is no sufficient evidence that the fever runs any definite course, and even those who maintain that it does so, allow that it conforms to more than one type in different cases.

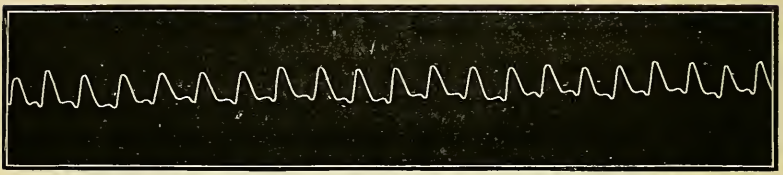
The Pulse.—The pulse of patients suffering from rheumatic fever is usually full and bounding but easily compressible, and the sphygmograph tracing resembles that obtained in other febrile disorders, exhibiting a well-marked dicrotic character. (Page 64, Nos. 1 and 4.)

Upon the following page are reproduced the pulse-tracings of two patients who were placed upon salicylic treatment. Nos. 1, 2, and

Sphygmograph Tracings from Patients with Rheumatic Fever (*Marey's Sphygmograph*).

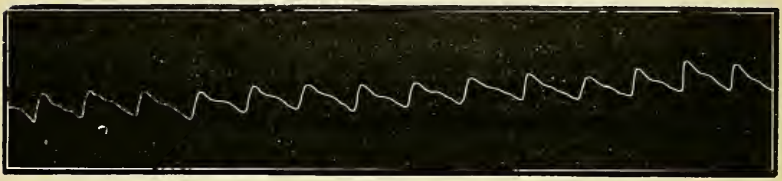
No. 1.

Female, age 16.—*Polyarthritis—Blowing Systolic Apical Murmur.* Trace=9 seconds.



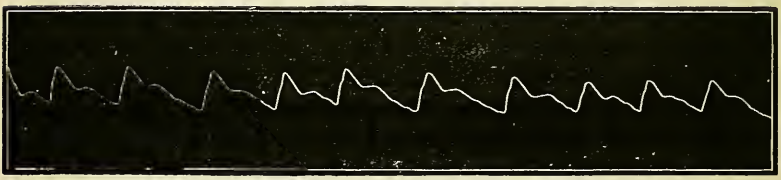
Immediately after admission to hospital, before the commencement of treatment. Temperature, 102°; pulse-rate, 140; moderate pressure.

No. 2.



Twenty-two hours later, after treatment with sodium salicylate. Temperature normal; pulse-rate, 104; articular pains gone low pressure.

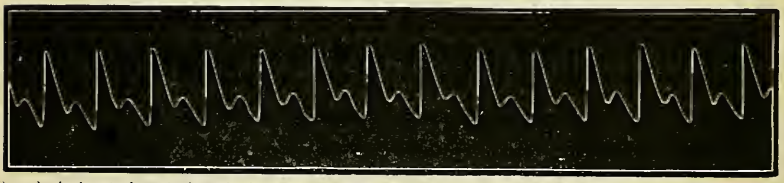
No. 3.



On the fourth day after admission. Temperature, 97.6°; pulse-rate, 72; low pressure.

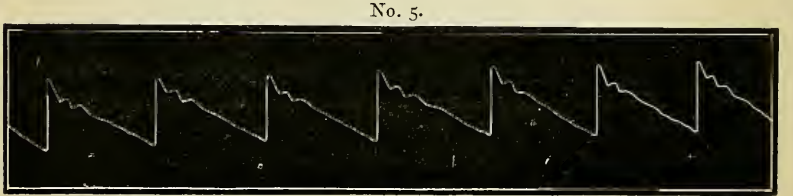
No. 4.

Male, age 24.—*Polyarthritis—Soft Systolic Apical Murmur.*



On admission to hospital with rheumatic fever. Temperature, 100.2°; pulse-rate, 92; low pressure.

No. 5.



The same patient as No. 4 five days later. Temperature, ⊥; articular pains gone; pulse-rate, 44.

3 represent the pulse of a girl aged sixteen, who was suffering from polyarthritis, and had a soft mitral systolic murmur. No. 1 was taken on admission, when the temperature was 102° and the pulse-rate 140 per minute. The tracing shows the ordinary febrile type. No. 2 was taken on the following day, when the temperature had fallen to normal, and the joint-troubles had disappeared, but the pulse-rate was still 104. The tracing no longer exhibits the dicrotic character. In No. 3 we have the natural pulse of the same patient. Nos. 4 and 5 represent the pulse of a man aged twenty-four, on admission with polyarthritis and incipient endocarditis, and five days later, when the temperature had fallen and the articular pains had entirely disappeared. M. Lorain, who so carefully studied the characters of the pulse in disease, writes as follows:—"The study of the pulse in this malady is of particular interest, on account of the damage which rheumatism inflicts upon the heart. One expects to find, in the course of the disease, well-marked disorders of the circulation, but this expectation is usually disappointed, for rheumatic endocarditis is often slight and transient. Pericarditis affects the pulse so little in most cases that the sphygmograph is, as a rule, of no use in the diagnosis of the condition."

The Sweat.—One of the most striking phenomena of rheumatic fever is the profuse sweat with which the patient is usually covered. This perspiration has a peculiar and characteristic acrid odour, and is often the cause of a copious eruption of sudamina. The profuse sweat is by no means invariably present, even in cases which in other respects conform to the ordinary type, and it sometimes happens that sweating is absent in a large number of cases occurring at about the same time. It is often stated that the sweat of rheumatic patients is abnormally acid, and it was this supposed excess of acidity which originally suggested the lactic acid theory of rheumatism. It was supposed that the profuse sweating was an effort on the part of the system to eliminate the poison of the disease, and that the so frequent onset of rheumatism after a chill was a result of a sudden arrest of the cutaneous excretion, leading to the retention of lactic acid in the blood. There is, however, little evidence of any undue acidity of the sweat of rheumatic patients. It is established that the acid reaction usually obtained in the sweat of persons in health is due to the development of fatty acids outside the body in the admixture of perspiration and sebaceous excretion with which the skin is covered; and Besnier states that even in cases of rheumatic fever, if the skin be first carefully cleansed with a neutral sponge, the freshly-excreted sweat, if

copious, has, as a rule, an almost neutral reaction. Sir Alfred Garrod has also frequently found the cutaneous excretion to be less acid than in health, and Bouillaud mentions that the acid reaction is by no means constant. In several cases in which I have tested the reaction of the sweat, after the skin has been carefully cleaned with a neutral sponge, after the method recommended by Besnier, similar results were obtained, but in some few instances the reaction was distinctly acid.

The Urine.—In the urine the amount of urea and uric acid is increased, as in other febrile diseases, and the degree of acidity is high. The colour is intensified in consequence of the diminution of the excretion. Dr. M'Munn has detected considerable quantities of urohæmin, or, as it is now called, urohæmato-porphyrin, in the urine of patients suffering from rheumatic fever, as well as in cases of so-called idiopathic endocarditis, and he attributes the presence of this substance to the destruction of blood-corpuscles, and to this destruction, the anæmia which is so marked a feature of rheumatism. A trace of albumen is sometimes present, even when the patient is not treated with salicylates, and occasionally large quantities of albumen and blood, indicating the onset of acute nephritis, are observed. Von Jaksch mentions acute articular rheumatism among the diseases in which he has detected peptones in the urine.

The Blood.—The most conspicuous change observed in the blood of patients suffering from rheumatic fever is an increase of fibrin, which increase is evidenced by the very conspicuous buffy coat which is formed when the freshly-drawn blood is allowed to coagulate.

M. Hayem believes that this increase of fibrin affords a valuable diagnostic sign in cases of obscure nature. He directs that a few drops of blood should be obtained by pricking the patient's finger, and that this should be placed upon a glass slide, so that the fibrinous network, which is formed when coagulation takes place, may be examined under the microscope. In one of the cases which he details in his paper, the red corpuscles were seen to be aggregated into compact *rouleaux*, which surrounded a small area containing only clear serum, and the number of white corpuscles was increased. When coagulation took place, a complete network of rather coarse fibres was seen to form. As might be expected from the conspicuous anæmia which is observed in rheumatic patients, and which is so marked in children, there is a diminution in the number of red corpuscles in the blood. The researches of Malassez (quoted by Besnier) show that the number of red corpuscles contained in a cubic millimeter, a

number which varies in health between three and a half and five millions, may be reduced to as low a figure as two millions in the course of an attack of rheumatic fever. Hayem has observed a simultaneous increase of white corpuscles. No excess of uric acid can be detected by the thread-test in the blood of patients suffering from rheumatic fever; nor has the presence of an excess of lactic acid ever been demonstrated. Even in the most severe cases the blood preserves its alkaline reaction. MM. Becquerel and Rodier found the solid elements of the serum, and especially the albumen, decreased in quantity, but in the cases which they examined the fats and cholesterin were in excess.

Although the pain is so intense that sleep is often out of the question until it is relieved, there is singularly little liability to cerebral disturbance in the course of rheumatic fever, and even when the temperature ranges high, the patient rarely wanders, even at night. It sometimes happens that the salicylic treatment causes delirium, but when no such explanation of the symptom is forthcoming, delirium is of very evil omen.

In female patients, according to Herard, the catamenia may be suppressed during the attack, but more commonly the natural period is anticipated.

Visceral Lesions.—The inflammatory lesions of the various internal structures, which constitute the most important accidents of rheumatic fever, will be discussed in detail in later chapters, and it is here only necessary to mention the various organs and tissues which may be attacked. Of the visceral lesions, endocarditis and pericarditis are at the same time the most frequent and the most important; and rheumatic endocarditis forms the starting-point of the great majority of all cases of valvular disease. It is, therefore, necessary to keep a careful watch upon the condition of the heart from day to day.

The pericardium suffers less frequently than the endocardium, but when pericarditis is developed, there is apparently a greater liability to a number of the less common rheumatic lesions. Of the remaining serous membranes, the pleuræ, and especially the left pleura, are most apt to be attacked, whereas unquestionable rheumatic peritonitis is so rare that it may be regarded as a clinical curiosity.

Pneumonia is not very uncommon, and, like rheumatic pleurisy, is usually left-sided at first. Actual lesions of the nerve-centres, such as meningitis, are extremely rare, but cerebral disturbance with hyperpyrexia is at the same time one of the most interesting and most fatal of the accidents of rheumatism. A more chronic

mental disturbance, the so-called rheumatic insanity, is met with in some cases.

Paraplegia and other spinal symptoms are sometimes recorded, but this subject has not yet been thoroughly investigated, and the claim of paraplegia to a place among rheumatic manifestations is still open to question.

Chorea is the nervous affection which most frequently makes its appearance in the course of rheumatic attacks, and in children it is met with in a considerable proportion of cases. Evidence of an affection of the peripheral nerves, either primary or secondary, is also occasionally forthcoming.

Cutaneous eruptions, such as erythema papulatum and marginatum, are not uncommon in the course of rheumatic fever, and less commonly urticaria, purpuric erythema, and erythema nodosum are observed. Sore throat is usually an initial symptom, but it may persist well into the attack, and may even be developed at a late period. The subcutaneous tissues may be the seats of nodular fibrous growths, and occasionally periosteal nodes are observed. Among the rare accidents of the disease, acute nephritis, thyroiditis, lymphadenitis, jaundice, and phlebitis, may be enumerated.

It will be seen from the above summary that there are few structures which enjoy complete immunity from rheumatic lesions either of the erythematous or fibrous kind.

The natural duration of rheumatic fever varies within wide limits, and whereas some attacks come to an end within so short a period as a single week, others last over five or six weeks, or even longer. Defervescence is usually gradual, and the morbid process seems to wear itself out, the joints which were last attacked recovering, while no fresh ones become involved.

Relapses.—At the present day one rarely has an opportunity of studying the natural course of rheumatic fever, for the adoption of the salicylic treatment is usually quickly followed by a fall of the temperature to normal or subnormal, and by a disappearance of the articular pains. Yet it would seem that the effect of these drugs is rather to hold the disease in check than to effect an actual cure; for when their administration is prematurely stopped, a return of the symptoms quickly follows; and even whilst the patient is fully under their influence, endocarditis, pericarditis, and even hyperpyrexia, may be developed. The recrudescences which follow the stoppage or too rapid reduction of the salicylates must be carefully distinguished from true relapses, in which a fresh attack is observed following closely upon apparently com-

plete recovery from the original illness. Such true relapses are by no means uncommon, and apparently result in many cases from some fresh exposure to cold, a too early return to meat-diet, or from the neglect of simple precautions. They may even occur while the patient is still in a hospital. The liability to relapse is greatest in those who have already suffered from several attacks of rheumatic fever. Dr. Church (who confines the use of the term *relapse* to secondary attacks in which there is a return of the articular pains, and a temperature of 100° is reached) estimates the proportion of cases in which they occur at 19.057 per cent., and in first, second, and third attacks respectively found the proportions to be as follows :—

First attacks . . .	15.150 per cent.
Second attacks . .	17.089 per cent.
Third attacks . . .	29.090 per cent.

Dr. Hilton Fagge speaks of relapses as occurring, a few days after the subsidence of the original attack, in between one-sixth and one-third of all cases of rheumatic fever. As a general rule, the relapse lasts for a few days only, and the temperature does not rise to any great height; some return of articular pains is almost invariably noted.

The following case illustrates the occurrence of a relapse in a patient treated without any special anti-rheumatic drugs:—A boy aged fourteen, who came of a rheumatic family, was seized on December 6, 1870, with pain in the knees, and then the shoulders, hips, ankles, and hands became affected. He was very anæmic. The heart-sounds were normal when he was admitted to King's College Hospital on December 18th. On December 22nd he felt much better, and his temperature had fallen from over 101° to 99.6°. On the 27th he had pain in the right wrist only, and the temperature was normal. The note of the 29th states that he was free from pain, and he continued to convalesce from that date until January 8, 1871. On January 8th he complained of a return of pain in several joints, which were swollen, and his temperature rose to 100.8°. On January 10th the pain and swelling of joints had increased, and fresh articulations became involved. The relapse continued until January 17th, when the note states that he was once more free from all pain. On January 24th he was discharged convalescent.

Chart III. fig. 5 is the temperature-curve of a somewhat similar case.

The alternation of apparent convalescence and relapse may be

repeated several times in succession, each relapse being attended by a fresh elevation of temperature and a return of the articular pains; nor does the relapse always conform to the type of the original attack, and the cardiac membranes which may have originally escaped may suffer for the first time during the secondary attack. In children the tendency to repeated rheumatic attacks of different characters, following closely upon each other, is especially well marked.

Mortality.—The mortality of acute rheumatism is very low, being estimated by the majority of observers at between 3 and 4 per cent. Pericarditis is responsible for the majority of deaths, but cerebral disturbance with hyperpyrexia is the most fatal of all the accidents of the disease, although its rarity fortunately prevents its contributing very greatly to the total death-rate. Of late years the number of deaths from this cause has been considerably reduced by the adoption of the treatment by cold baths or the ice-pack. In some cases pericarditis kills by the mere mechanical interference with the heart's action, which arises from the volume of the effusion; and in children who pass into a condition of rheumatic dyscrasia after repeated attacks, pericarditis often immediately precedes the fatal ending. Among the remaining fatal lesions pneumonia is probably the most important. Death may also result from old valvular lesions dating from a previous acute attack, or from the detachment of large emboli, and in some few cases the endocardial lesions assume the malignant form.

In the second edition of Dr. Fagge's treatise on medicine, Dr. Pye Smith states the causes of death in twenty-six fatal cases which he collected. In five of these death was due to hyperpyrexia with delirium; in one, to acute pneumonia with delirium tremens; in four, to pneumonia with cardiac lesions; and in thirteen, to severe pericarditis or valvular disease, or both. The remaining three patients died from accidental complications, viz., enteric fever, diphtheria, and epilepsy. Dr. Fagge himself mentions that in sixty fatal cases treated in Guy's Hospital, death resulted from pericarditis in eighteen, and from old valvular disease in three.

Of the enormous majority of patients who recover, many escape without any evil effects; many are left with their hearts damaged for life, either by lesions of the valvular structures, or by the adhesion of the surfaces of the pericardium; and many more suffer from various troubles connected with the joints, such as stiffness, or the so-called chronic articular rheumatism.

CHAPTER VIII.

RHEUMATISM IN CHILDHOOD.

Its many-sidedness—The heart suffers rather than the joints—Isolated rheumatic endocarditis—Subcutaneous nodules—Pericarditis—Chorea—The erythemata—Urticaria—Purpuric erythema—Sore throat—The nervousness of rheumatic children—Temperature—Anæmia—Cases in very young children—Examples of rheumatism in childhood.

THERE are many attacks of rheumatism which do not conform to the type of rheumatic fever, either because the articular symptoms are slight and are not attended by any objective signs of inflammation, or because they occupy a subsidiary position to other and more conspicuous manifestations of the disease. Of this nature, apparently, are many attacks of erythema in adults, in which the skin eruption is attended by more or less severe joint pains; and the slight articular troubles to which rheumatic patients are so liable after any exposure to cold and damp; but it is in children that the abarticular forms of rheumatism are best seen, and from a study of the malady as it manifests itself in early life we obtain a far clearer notion of its many-sidedness than it is possible to do if we confine our attention to the articular rheumatism of adults. In children the heart rather than the joints is the part especially liable to be attacked, but yet there are few rheumatic children who do not, sooner or later, suffer from articular troubles, either trifling or severe. Successive attacks occurring in the same child often present so little outward resemblance to each other, that they appear, at first sight, to have little in common, but the manifestations which are exhibited are all of them such as are occasionally met with in association with undoubted rheumatic fever.

Endocarditis.—Not infrequently the disease appears to expend itself entirely upon the cardiac membranes, and a slight indisposition, attended by a trifling rise of temperature, such as is readily

ascribed to some other cause, may be the only outward indication of an attack of rheumatism which may leave the heart damaged for life; and it is probable that in many cases of valvular disease in which no history of articular pains can be obtained, nor of any malady which is known to be associated with endocarditis, the lesions have their origin in such an illness as this. It may, of course, be urged against this view, that we are not justified in attributing unexplained endocarditis to this cause, in the absence of all other recognised manifestations of the rheumatic state; but strong evidence may be adduced in support of the rheumatic origin of such cases. In the first place, it can be shown that many of the children who suffer in this way are the offspring of parents who have suffered from articular rheumatism. I have had under my care, at the same time, two children of a rheumatic father, both of whom had systolic apical murmurs, to all appearance organic, although neither of them was known to have ever suffered from pains in the joints or from chorea; and in another instance, a woman who had herself had rheumatic fever, which had left her heart considerably damaged, brought her little boy who was suffering from a slight febrile attack, and who had a similar murmur, which was apparently of recent origin; and such examples might be multiplied indefinitely. Further evidence is afforded by the fact that such isolated endocarditis may be merely the first of a long series of events of an undoubtedly rheumatic character, for it is by no means rare, as Dr. Cheadle has pointed out, to find, in children suffering from some of the various manifestations of the disease, signs of valvular lesions obviously dating from some earlier period than the present attack, although the most careful questioning of the mother fails to bring to light any history of previous articular pains or chorea. In such cases we are driven to the conclusion that the endocarditis did actually precede all other rheumatic events.

Subcutaneous Nodules.—The same lesson is taught by the frequent association with the endocarditis of articular troubles so trifling that they are only recognised from the resistance which the child opposes to extension of the affected joints, but which serve to confirm the diagnosis of rheumatism; and by the occasional development of a crop of fibrous nodules upon the tendon sheaths or bony prominences about the joints.

An excellent example of this was afforded by the case of a little girl seven years old, who came under my care on account of the appearance of such nodules upon the extensor tendons of the hands, and upon the bony prominences about the elbow-joints.

The heart was considerably hypertrophied, and loud præsystolic and systolic murmurs were heard at the apex. No history of any articular pains could be obtained, and at the time when I saw her there were certainly none such present. The child's mother stated that she had herself suffered from rheumatic fever, and a brother was under treatment at the time for subacute articular rheumatism, unattended by any cardiac lesion.

It will not, I think, be questioned that such cases as this go far towards establishing the view for which I have contended, that unexplained endocarditis occurring in a child is presumably of rheumatic origin. These nodules, which are far commoner in children than in adults, constitute one of the most remarkable phenomena of the rheumatism of early life.

Pericarditis.—Like endocarditis, pericarditis may appear apart from any other rheumatic events; and in children it is of common occurrence, and constitutes the chief source of danger in the disease. Dr. Cheadle has pointed out that in childhood pericarditis usually runs a less acute course than in adult life, and is less apt to be attended by any great rise of temperature. Frequent relapses occur, each relapse leaving the pericardium thicker than it was before; and subcutaneous nodules, which are so intimately associated with vegetative endocarditis, are also frequently developed in connection with this fibrous pericarditis, and sometimes attain to an unusual size shortly before the death of the patient.

Chorea.—Among the remaining manifestations of rheumatism which are specially common in children, chorea holds a prominent place, and is often associated with endocarditis in cases in which the joints escape entirely. Without entering here upon the difficult question of the relation of chorea to rheumatism, the discussion of which is reserved for a later chapter, I may express my belief that the endocarditis which in so many instances attends chorea, affords evidence that in such cases the nervous symptoms are of rheumatic origin. I have more than once witnessed the development of subcutaneous nodules in association with chorea and endocarditis, in cases in which there was no evidence of past or present articular troubles, and I believe that such cases afford very valuable evidence of the correctness of the above view.

Chorea, like endocarditis, may be the earliest manifestation of the rheumatic state, but more commonly it appears as a later event in the series, either in direct association with, or as an immediate sequel of, more definite rheumatic attacks, or in

patients who have suffered from articular rheumatism at some earlier period. Many rheumatic children exhibit a slight incoordination of movement, evidenced by twitching of the facial muscles or by some awkwardness of the hands and arms, which is hardly worthy of the name of chorea, and which may escape notice unless carefully looked for; and between such trifling symptoms and the most pronounced form of St. Vitus' Dance, every grade is met with.

Erythema.—The cutaneous eruptions classed together under the name of erythema multiforme, and especially the papulate and marginate varieties, although by no means confined to early life, are conspicuous among the manifestations of rheumatism in childhood. It may, indeed, be asserted that the majority of rheumatic children develop such eruptions at some period in the course of the disease, but when they are limited to a few spots upon the chest and arms, they may easily escape notice; and so transient are they, that they may appear and disappear in the intervals between the patient's visits. Mothers often mistake the eruption of erythema marginatum for ringworm, and a history of this affection upon the limbs and trunk with rapid recovery should cause us to be on the look-out for the development of an erythema. Closely allied to the erythemata is the remarkable skin affection urticaria, which also has a place in the rheumatic series; but rheumatism has probably but a small share in the causation of urticaria, which is more often due to dietetic influences. Erythema nodosum and the affection known as purpura rheumatica are also met with in rheumatic children.

Sore Throat.—Associated with the above-mentioned conditions, either as a part of the same attack, or as one member of a series of rheumatic manifestations, sore throat is a prominent feature in the rheumatism of early life. In those cases in which I have had an opportunity of observing the condition of the throat during the attack, I have usually found the tonsils acutely inflamed, and exhibiting patches of follicular exudation upon their surfaces; but this is not invariably the case, and, as in adults, there may be merely redness and swelling of the mucous membrane of the palate and fauces, without any obvious enlargement of the tonsils.

Nervousness.—Dr. Goodhart was, I believe, the first to call attention to the nervousness of rheumatic children, and their liability to night terrors; and Dr. Cheadle has also laid great stress upon this point. Of the truth of their statements any one can easily convince himself by questioning the mothers of such

patients, or even from their volunteered remarks. He will find that, as Dr. Cheadle says, the rheumatic child is usually the nervous member of the family, a point which is of great interest from its bearing upon the relation of chorea to rheumatism.

Temperature.—I have already mentioned that in the rheumatism of childhood the temperature range is, as a rule, considerably lower than in adults, and this is the more remarkable when it is considered how readily the temperature of a child runs up from apparently trifling causes. This afebrile character is connected with the nature of the rheumatic lesions to which children are most liable, with the comparative rarity of severe arthritis, and the great frequency of endocarditis and its allies. Indeed, in the abarticular forms there is often hardly any febrile disturbance, and, unless the pericardium is attacked, the temperature rarely exceeds 100°. Profuse sweating is far less common than in adults, but in cases in which there is an eruption of erythema only, the sweat may be copious and acrid, like that of an adult with rheumatic fever. Anæmia is an even more conspicuous result of the rheumatic process in childhood than in later life, and the pallor, which persists long after an attack, shows how important a place must be assigned to rheumatism amongst the maladies which tend to destroy the red corpuscles of the blood.

There are, of course, many cases in which the disease conforms more or less closely to the ordinary type of rheumatic fever, but in these there is a greater liability to cardiac affections than in later life, and chorea, nodules, and erythematous rashes are often developed in the course of the attack. The grave form of cerebral disturbance which is accompanied by hyperpyrexia, is unknown in earlier childhood. Apparently no age is too early for the development of rheumatism, for the disease has been observed in infants a few weeks, or even a few days old, and this especially in children who have been born whilst their mothers were suffering from rheumatic fever. It must, however, be borne in mind in connection with such cases, that infants are liable to other forms of arthritis beside the rheumatic variety.

The different points to which attention has been called in the above sketch of the characters of rheumatism in childhood are best illustrated by a few examples, showing the various forms which the malady assumes at that period of life.

I. A girl who had suffered at the age of ten years from an attack of chorea, following a fright, came under observation two years later with swelling of the knees and ankles, which were the seats of intense pain. A month later subcutaneous nodules made

their appearance, and continued to develop in successive crops, so that, as time went on, they occupied almost every possible situation. The heart was found to be greatly hypertrophied, and there were loud mitral præsystolic and systolic murmurs.

II. A girl aged eleven years, who was stated to have suffered from chorea, following a fright, two years previously, and who had had slight returns of the choreic movements since, developed subacute arthritis of many joints, and three months later the appearance of subcutaneous nodules was followed by a fresh attack of chorea.

III. Another patient, also a girl, fifteen years of age, came under my care with gastric disturbance, associated with an eruption of erythema papulatum and trifling articular pains. When eight years old she had suffered from a severe illness, of the nature of which her mother was uncertain, and the medical man who attended her at the time expressed anxiety as to the state of her heart. In the autumn of 1886 she suffered from subacute articular rheumatism, and when I first saw her in the spring of 1888, she had præsystolic and systolic murmurs. She was admitted to the hospital, and during the following four months passed through a series of attacks of erythema of the papulate and marginate varieties, in the course of one of which she developed acute pericarditis, without any articular pains. In December 1888 I again saw her, and she then had large patches of erythema on the right leg, each of which had somewhat the character of erythema nodosum, but was crowned by a group of bullæ. These disappeared in a few days, and were followed by follicular tonsillitis and a fresh eruption of erythema papulatum, and at the same time a crop of subcutaneous nodules appeared upon the extensor tendons of the hands and about the elbows.

IV. A girl, aged ten years, was brought to the West London Hospital in the spring of 1888, where she was under the care of my colleague Dr. Seymour Taylor. She was suffering from an attack of subacute articular rheumatism, in the course of which a copious eruption of erythema marginatum appeared, and a systolic mitral murmur was developed. I first saw the child in August 1888, when she was suffering from urticaria, widely distributed over the face, trunk, and limbs. The urticaria recurred almost daily for some weeks, but there was no return of the erythema. The systolic murmur was loud and harsh, and the heart was considerably hypertrophied. The child was very anæmic, and continued in bad health until December, when small but well-marked subcutaneous nodules appeared upon the flexor tendons of the

ring-fingers, in symmetrical positions upon the patellæ, and upon the left parietal bone. The nodules disappeared in a few weeks.

V. Another girl, also ten years old, who had no family history of rheumatism, came under my care on account of a slight attack of chorea, accompanied by pain and swelling of several joints. Her mother stated that she was the only nervous one among her children, and was likewise the only one who suffered from rheumatism. Two years previously she had suffered from chorea; and seven weeks before I saw her the ankle-joints had become affected, the arthritis afterwards attacking the joints of the hands and the right elbow. For one week a slight return of the choreic movements had been noticed. On examining the heart, the signs of mitral regurgitation were found to be present; and nodules were present upon the extensor tendons of the hands, the scapulæ, vertebral spines, and malleoli. She was treated with an alkaline quinine mixture. A week later the joints were greatly improved, the choreic movements were very slight, and the nodules had not increased in size, nor were any fresh ones developed. She exhibited, however, two fresh rheumatic phenomena; her throat had become sore, the tonsils being red and swollen, and showing follicular patches; and there was a large patch of erythema of irregular outline, surrounded by spots of erythema papulatum, situated just above the right elbow. From this time the patient continued to improve, but a few of the nodules attained to a large size, and fresh eruptions of erythema appeared from time to time for some weeks, and on one occasion the left side of the chest was covered by characteristic rings of erythema marginatum.

Some of the above cases afford illustrations of the tendency of the rheumatic process to retain its activity for months, or even years, manifesting itself now in one form, now in another, and often remaining latent for a time. Sometimes, indeed, the patients pass into a condition of veritable rheumatic dyscrasia; are never free from symptoms of the disease; and gradually become more and more anæmic and less able to stand its assaults, until, in the course of time, one or other of the more serious accidents of rheumatism, usually pericarditis, closes the scene. On the other hand, a patient who has never previously shown any rheumatic tendency may pass through an acute attack, and may be free of the disease for years, or even for the rest of life, and may transmit no hereditary rheumatic tendency to his children. It is only of comparatively recent years that the importance of the study of the rheumatism of childhood has been

fully realised, and the progress which has been made in this direction is in great measure due to the labours of Drs. Goodhart, Cheadle, Thomas Barlow, Angel Money, and Warner, who have done so much towards showing the dependence of the various phases of the disease which are met with at that period of life upon one common cause. The importance of the subject depends in part upon the light which this study throws upon the characters of the rheumatic process, and in part upon the aid which it affords in the diagnosis and treatment of a number of obscure ailments of children, which, although apparently trivial, may result in irreparable damage to the cardiac structures.

CHAPTER IX.

ARTHRITIS.

Arthritis only one of many manifestations of rheumatism—Relations of the acute arthritis to cutaneous erythema—Special characters of rheumatic arthritis—No joint enjoys immunity—Arthritis of the crico-arytenoid joints—The distribution of the articular lesions—Friedländer's views as to the order of invasion of the joints—Objections to these views—Influence of external causes upon the distribution of the lesions—Rheumatism in hemiplegic subjects—Clinical features of rheumatic arthritis—Changes in cutaneous sensibility over the inflamed joints—Sequelæ—Chronic articular rheumatism—Rheumatoid arthritis—Suppuration has no place in the rheumatic process—Chronic synovitis—Diagnosis of acute and subacute rheumatic arthritis—*Post-mortem* appearances.

Inflammation of the joints, which was long considered to be the essential feature of the rheumatic process, and is certainly the most constant and conspicuous of all its local manifestations, may well claim the first place in any description of the phenomena of the disease. There is, however, no reason why it should be placed in any different category from the other local lesions, such as pericarditis and endocarditis, and the exaggerated importance which has been attached to arthritis has, I believe, tended to retard materially the progress of our knowledge of rheumatism. In adult life, it is true, arthritis of greater or less severity is developed in the course of the enormous majority of rheumatic attacks, and in older patients it is usually the only local manifestation of the malady, but in childhood, as has been seen, it occupies a subordinate position to the cardiac affections, and is not infrequently altogether wanting in any particular attack.

The most striking characteristic of the arthritis of acute rheumatism is the extreme rapidity of its development, and its equally rapid subsidence, features which are best seen in the most acute cases. However great the swelling may be, and however acute the inflammatory process, there is no tendency to the development of pus, and the joints of those who have succumbed in the

course of an attack of rheumatic fever, usually exhibit, to the naked eye at least, no indication of morbid process of which they were the seats during life. Another peculiarity is the readiness with which the inflammatory process spreads from joint to joint, fresh articulations becoming involved, while those which were first attacked are recovering. As has been already pointed out, in these respects the arthritis of acute rheumatism exhibits suggestive resemblances to another set of rheumatic lesions, the cutaneous erythemata, which seem to justify the opinion, long ago put forward by Monneret, that the arthritis of acute rheumatism is an erythematous affection of the joints, a mere active hyperæmia or inflammatory œdema. This view is, of course, only applicable to the most acute form, for in the more lasting varieties of rheumatic arthritis, changes in the fibrous tissues which enter into the structure of the joints doubtless play an important part.

The arthritis of rheumatism is essentially multiple, and although a single joint may suffer alone at the very commencement of the attack, others soon become involved. In subacute cases the number of joints attacked is often very limited, but true rheumatism is rarely monarticular; and it is not going too far to say that any arthritis which remains confined to one joint for any length of time should not be classed as rheumatic, unless strong evidence of such origin is forthcoming. The larger joints are especially liable to suffer, but the inflammatory process not infrequently involves the small articulations of the feet and hands. In some cases a considerable degree of symmetry is observed, but this is never at all comparable to the symmetry of rheumatoid arthritis, and is often conspicuous by its absence. There is probably no articulation of the body which enjoys complete immunity from the attacks of rheumatism, nor are the diarthrodial joints alone involved; for, as Monneret and Lebert have shown, even the symphysis pubis and the sacro-iliac synchondroses may have a share in the morbid process.

As is the case in so many articular diseases, the knees are especially liable to be attacked, as may be seen from the following table, which shows the relative frequency with which the different joints suffered in four series of cases:—

Haygarth.		Hirsch.		Monneret.		Forty Cases at St. Bartholomew's Hospital.	
Knees	72	Ankles	136	Knees	116	Knees	35
Shoulders	43	Knees	134	Wrists	93	Shoulders	33
Ankles	42	Wrists	102	Ankles	79	Ankles	27
Hands	38	Elbows	86	Shoulders	67	Wrists	18
Feet	38	Shoulders	86	Elbows	34	Elbows	18
Wrists	36	Fingers	48	Fingers	24	Hips	10
Hips	31	Hips	45	Hips	17	Feet	7
Elbows	10	Toes	21	Toes	6	Hands	6
Fingers	9	Spine	16	Sterno-clavicular	5		
Toes	2	Jaw	2	Symphysis-pubis	1		

Dr. Friedländer believes that the joints tend to be invaded symmetrically and in a particular order; that the feet and ankles suffer earliest, and that the morbid process next attacks the knees, hips, and lumbar spine. In the arms the shoulders are, according to this author, first invaded, and afterwards the elbows, wrists, and hands, and last of all the cervical spine, and the sterno-clavicular and temporo-maxillary joints become involved. The heart he found to be usually attacked after the joints of the legs, but before those of the arms. Friedländer himself acknowledges that there are many cases in which this order is not adhered to, and he endeavours to explain this by supposing that joints which have been passed over in the upward progress of the disease from the feet to the hands may be subsequently attacked in the same order,—in other words, that the disease may return and pick up the articulations which have been omitted; and it is obvious that if the possibility of such supplementary cycles be admitted, it is possible to explain all irregularities in the order of invasion, and to reduce all cases, however abnormal, to a common type. It is true that the ankles are very often the first joints to be attacked, and share with the knees the chief liability to acute rheumatic arthritis, but in many cases the order of invasion is such that it is impossible to believe that there is any such definite law controlling the distribution of the lesions. I may take two actual examples as illustrating this point. One patient was admitted to a hospital on the second day of his illness with the ankles, wrists, and shoulders affected; on the fifth day the knees were attacked, and on the sixth the right hip, the joints of the arms having in the meantime nearly recovered; but on the seventh day the left wrist and shoulder were involved afresh. In another case the right shoulder was attacked on the second day of the illness, and on the fifth day the right knee and ankle, as well as the left shoulder and elbow, became involved.

The influence of external causes in determining the seats of the lesions is far less conspicuous in rheumatism than in gout; but, as has been already stated, when rheumatic fever follows an injury, the joint nearest to the seat of injury is usually the first to suffer. Dr. Fuller has laid special stress upon the liability of joints which have been the seats of local mischief. Dr. Maclagan also regards strain as the most important influence at work in determining the seat of rheumatic lesions; and Drs. Peter, Simpson, and others, have expressed their belief that the joints which are most exercised are specially liable to rheumatism. M. Besnier, who is inclined on the whole to agree with them in this opinion, does not think that the rule is sufficiently general for the establishment of a definite law. The special liability of the knees, which is even seen in gout and rheumatoid arthritis, in which diseases these joints suffer more often than the other large articulations, is probably in great measure due to the peculiarities of their structure, and to the strain to which their ligaments are so constantly exposed. It has been observed that when gout develops in hemiplegic subjects, the joints of the paralysed limbs are chiefly or alone affected, and Blum has observed the same thing in a case of rheumatism, but the difference between the two sides was less marked than in the cases of gout recorded by Landré Beauvais, Charcot, Bourneville, and others.

The temporo-maxillary joints are so rarely attacked with acute rheumatic arthritis, that their involvement, in any given case, will always suggest a doubt as to the correctness of the diagnosis, for these joints are far more subject to gonorrhœal and to rheumatoid arthritis.

The diagnosis of arthritis of the crico-arytenoid joints has been sometimes made, and such cases must be distinguished from those of so-called rheumatic paralysis of the abductors, which has no connection with acute rheumatism, but owes its name to the fact that it is due to cold. Schützenberger has related the case of a young woman who died in the course of an attack of rheumatic fever from pericarditis and œdema of the lungs, and whose left crico-arytenoid joint was found to contain an excess of fluid. Two other cases are recorded by Hirsch, whose first patient was a young man aged twenty, who in the course of an attack of rheumatic fever complained of pain in the region of the larynx, especially upon the right side. The pain was much increased by the act of deglutition, and the voice was rather hoarse. The laryngoscope showed injection of the parts about the larynx, and much redness and swelling over the right

arytenoid cartilage, extending to the aryteno-epiglottidean fold. The rima glottidis expanded only slightly during phonation, and the movements of the right cord were impaired. Within a week the laryngeal signs and symptoms had entirely disappeared. In the second case, the symptoms and laryngoscopic appearances were very similar, but both sides of the larynx were involved.

The severity of the articular inflammation varies very greatly in different cases of acute and subacute rheumatism. Sometimes there is merely pain on movement, without any objective signs of inflammation; at others, there is extreme swelling of the structures around the joints, erythematous redness of the skin, and evidence of considerable effusion into the synovial capsule. In young children some resistance to passive movements of the limbs, or some alteration of the gait, due to the knees being slightly flexed, may be the only indication of the articular mischief. Dr. Cheadle has pointed out that these symptoms are often due to inflammation of the sheaths of the hamstring tendons, and that the joints themselves may have escaped. Effusion into the tendon-sheaths is by no means uncommon in adult life also, and the swelling to which it gives rise may constitute the most conspicuous feature of the attack (fig. 1). Even in cases severe enough to be classed as subacute articular rheumatism, in which the swelling of the joints is considerable, the patient may still be able to drag himself about, but this is out of the question in really acute cases. All the parts covering

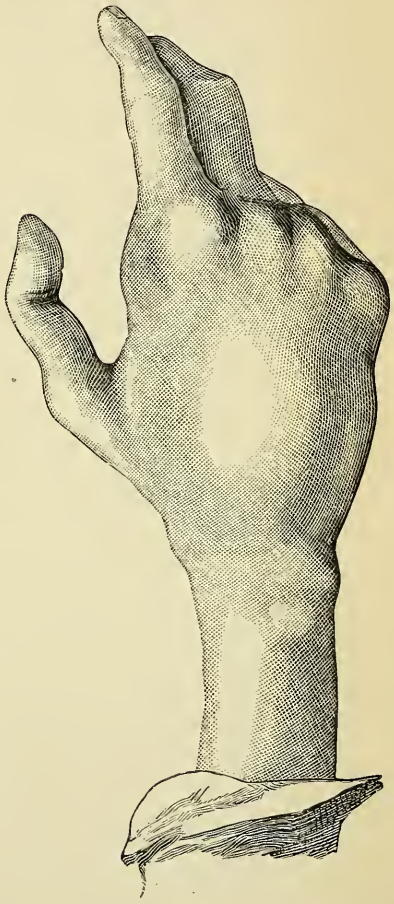


Fig. 1.—Gangliform Swelling on the Dorsum of the Hand of a Child aged Eight, under the care of Dr. T. Barlow.

the affected joints contribute to the swelling, and there may even be some local œdema. This is best seen upon the dorsum of the hand, where the skin may have a somewhat translucent appearance. The skin may retain its natural colour, but is usually suffused by a more or less intense pink blush. The amount of synovial effusion is subject to great variation, being sometimes so great as to constitute the bulk of the swelling, and it has seemed to me that it is often greatest in patients who have passed the age at which rheumatic fever is most common. Some local increase of temperature can be appreciated by the hand, and a rise of two or three degrees is usually indicated by the surface thermometer.

Cutaneous sensibility is remarkably modified in the region of the inflamed joints, as has been shown by the investigations of Drosdoff, Abramowski, Barbillon, and Angel Money. Tactile sensibility is sometimes intensified, but is more usually diminished. The power of distinguishing between heat and cold is often lost or perverted, and Barbillon found that whereas the sensation of cold was less distinct than normal, that of heat was intensified. Most observers agree that the Faradic current, applied with a dry electrode, is little, if at all, felt; but Abramowski obtained an opposite result. Drosdoff even asserts that the loss of Faradic sensibility may be observed for as much as two or three days before any signs of inflammation are observed in a joint. The loss is usually limited to the immediate neighbourhood of the articulations, but in some instances Barbillon has found it to extend to an entire limb. The same observer has also found that the neighbouring tendon-reflexes are diminished or absent, even after all pain has disappeared from the joints. Barbillon states that he was unable to detect similar changes of sensibility in other forms of arthritis, such as the gonorrhœal, scarlatinal, and pyæmic, and he suggests that they may be due to the inflamed condition of the integuments, which is so noticeable a feature of the arthritis of rheumatism. This view receives support from the fact, to which I can myself testify, that loss of Faradic sensibility is often to be met with in the neighbourhood of joints affected with acute gout, whereas in subacute cases the Faradic current is, as a rule, more distinctly felt than in the sound parts. I may mention also, that, unlike Barbillon, I have found considerable diminution of Faradic sensibility in some cases of gonorrhœal arthritis.

As long as an attack of rheumatic fever continues, fresh joints are liable to be attacked. This, coupled with the rapid recovery

of others already involved, gives the appearance of a shifting of the lesions from joint to joint. There is, however, no true metastasis of the arthritis, and the invasion of any joint has no necessary connection with the recovery of another. Nor is there any metastasis from the joints to the internal organs. In some cases, when chorea or hyperpyrexia come on, there is a simultaneous recovery of the joints, but more commonly the arthritis continues with undiminished intensity during the development of visceral accidents.

It is by no means rare for pain and swelling of the affected joints to persist for some time after the acute process has come to an end. When this is the case, the symptoms are probably due to changes produced by the acute attack, and do not afford evidence of the continued activity of the specific rheumatic process. This view receives support from the fact that the salicylates, which may have had a powerful action in subduing the articular inflammation at an earlier period of the attack, are often powerless to remove such residual pain and swelling, whereas these may yield readily to the alkaline-quinine treatment. Very commonly a certain amount of stiffness remains for a long time, due to the formation of adhesions outside the capsules of the joints, and this, if taken in time, is, as a rule, removed by passive movement of the parts. The so-called chronic articular rheumatism, which will be considered separately, is most often met with in those who have suffered from rheumatic fever at some previous time, but it may originate from other causes, and is probably in most instances a simple and local arthritis, having its seat in the damaged joints; although there may be occasional exacerbations due to the intercurrent development of subacute rheumatic inflammation.

Rheumatoid arthritis is an important, although not a common, sequela of the rheumatic joint-lesions. I believe that when it so occurs, it is merely as a result of the damage done to the joint by the acute process; that the changes are entirely distinct in nature and origin from those of true rheumatism; and that they are equally liable to follow any other kind of acute arthritis.

In the rare cases in which suppuration occurs in a joint which has been affected by what is, to all appearance, a true rheumatic arthritis, it is probable either that the original disease was not really of this nature, or that the suppurative arthritis is a secondary and accidental complication. In the earlier writings upon rheumatism, and even in the works of authors so recent as M'Leod and Bouillaud, many cases are quoted as examples of

rheumatic fever in which suppuration occurred in the joints, but which seem to have been in reality of a pyæmic nature, and this confusion of rheumatism with pyæmia detracts very much from the value of the older statistics. At the present day, it is almost universally admitted that suppuration has no part in the phenomena of rheumatism. On the other hand, chronic synovitis is a by no means uncommon sequela of rheumatic arthritis. After the acute attack, one or more of the affected joints, instead of recovering like the others, may become greatly swollen from the accumulation of synovial fluid in the cavity, and if this affection has its seat in one of the joints of the lower extremities, it may greatly prolong the period of the patient's confinement to bed. When the ankle-joints have been the seats of long-continued rheumatic inflammation, the ligaments in the neighbourhood are very apt to yield when the patient gets about again, and the occurrence of flat-foot may frequently be traced to such an origin.

The diagnosis of the rheumatic from other forms of arthritis does not often present any great difficulty in acute cases, for the nature of the case is usually revealed by the presence, in connection with the joint-lesions, of other rheumatic phenomena, such as a profuse sour-smelling sweat, or of endocarditis or pericarditis. The transitory and shifting character of the joint-lesions themselves will, moreover, help to confirm the diagnosis. Nevertheless, in its early stages pyæmia, especially when it is of the so-called medical variety, may very closely simulate rheumatic fever; but in such cases the state of the tongue, as well as the general condition of the patient, will often suggest a doubt, which may be confirmed by the discovery of an acute periostitis, or of purulent disease of the middle ear. In this connection the fact must be borne in mind that some of the joints may clear up without abscess formation, and that such recovery by no means excludes a septic origin. In the subacute forms the difficulties which surround the diagnosis are often very much greater. The lesions of subacute polyarticular gout are sometimes clinically indistinguishable from those of rheumatism, but here the patient's antecedents will usually reveal the true nature of the attack. Gout rarely involves several large joints in its earlier attacks, and a history of typical gout in the great toe at some former period will, as a rule, be forthcoming. Further aid may be obtained from the family history of the sufferer, or from the presence of the characteristic tophi on the cartilage of the ear.

The clinical features of gonorrhœal arthritis are not identical with those of the rheumatic variety. There is, as a rule, less

swelling of the parts covering the diseased joints, and the synovial effusion is apt to be greater. The joints attacked are usually fewer in number, and the arthritis is more lasting, and yields far less readily to treatment than that of rheumatism. With it may be associated conjunctivitis or iritis, and pains in the fasciæ or balls of the toes. It is probable that rheumatoid arthritis, when it assumes an unusually acute form, is, in its early stages, sometimes mistaken for subacute rheumatism, and that this accounts for some of the instances in which rheumatoid arthritis is thought to develop as a sequela of true rheumatism. Again, there is a form of arthritis due to syphilis, which is often accompanied by periostitis of one or more of the neighbouring long bones, and which rapidly clears up under anti-syphilitic treatment. I believe that this is rather frequently confused with rheumatism, and that it is probably the condition which has been described as periosteal rheumatism by some authors. Speaking of the periosteal variety, Dr. Fuller says that it is especially apt to attack those who have been depressed by the action of the syphilitic poison or by long-continued mercurial action. Amongst other varieties of arthritis which have to be distinguished from true rheumatism are those which occur in the course of various specific fevers other than scarlatina; that which occurs as a sequela of dysentery; the various arthrites resulting from gross lesions of the nervous system; those which complicate hæmophilia, and other hæmorrhagic diseases; and certain joint-affections, which are usually monarticular, which have not yet been satisfactorily differentiated, and referred to their true places in the morbid series.

In the great majority of instances, joints which are the seat of acute rheumatism show no obvious changes *post-mortem*. A small quantity of fluid or flakes of lymph may be found in the articular cavity, and there may be some injection of the synovial membrane. Many of the descriptions which have been given of the morbid changes in the joints without doubt refer to arthritis of other varieties, and it is therefore very difficult to form any clear idea of the limits of the process. Lebert describes the hyperæmia of the synovial membrane, which becomes dull and lustreless owing to the throwing off of the lining endothelium; and as regards the joint-contents, he speaks of every variety of fluid, from a mere excess of the ordinary synovia to typical pus. In the same way, MM. Cornil and Ranvier say that in certain cases of acute rheumatism, in which the inflammation is fixed in a few joints or in a single one, the articular cavity is filled with creamy pus. Now it will, I think, be generally acknowledged at the

present day, that the presence of pus in the joints is in itself sufficient proof that the case is not one of uncomplicated acute rheumatism, and the statements above quoted show that we cannot rely upon finding, even in the writings of the most eminent pathologists, an account of the morbid characters of rheumatic arthritis pure and simple.

MM. Cornil and Ranvier assert that, in addition to the changes in the synovial membrane, the cartilages are always more or less affected, even in the most transitory attacks. In the slighter cases these changes are only appreciable by the microscope, and consist in an increase in the size and number of the cells, not evenly throughout the extent of the cartilage, but in foci disseminated through its substance. In more severe cases there is obvious swelling of the articular cartilage, and ultimately the cell-proliferation may lead to fibrillation of the matrix.

"When a section is made perpendicular to the surface of the cartilage in the parts where it is swollen, a microscopical preparation is obtained in which is seen an active proliferation of the deep, and even of the calcified layers of the cartilage. The multiplication of cells, and formation of secondary capsules, is in no way different from that which has been described in the superficial layers; only as the primitive capsules of the middle zones are disposed in lines, and are compressed one against the other, they become elongated and form cylinders perpendicular to the surfaces of the cartilage, whereas the superficial lenticular capsules, becoming filled with secondary capsules, form rows which have a direction parallel to the surface.

"The cellular proliferation is constantly accompanied by segmentation of the ground-substance lying between the primitive capsules, and this segmentation causes striæ in the preparations parallel to the long axes of the primitive capsules. It results from this, that in the deep layers this segmentation is perpendicular, whereas in the superficial layers it is parallel to the surface.

"When the process is very advanced, the striæ give rise to fissures, which divide the diseased cartilage as if it had been incised. These incisions are parallel to the surface in the superficial zones, and perpendicular in the deep ones.

"This decomposition of the cartilage, which might be confused with the *velvet-like* condition of chronic rheumatism, differs notably from it, as will be seen later."

All the structures which enter into the constitution of the joint, as well as the skin and subcutaneous tissue which covers

it, are more or less affected by the acute rheumatic inflammation, and changes similar to those met with in the synovial capsule often extend to the neighbouring tendon-sheaths.

According to Senator, the fluid contained in the joints is of alkaline reaction, and rich in albumen and fibrin; and exhibits under the microscope, in addition to more or less altered cells derived from the synovial membrane, varying numbers of red and white blood-corpuscles. He describes it as chiefly differing from synovial fluid in its more liquid character. Bouchard, on the other hand, has found this fluid distinctly acid in some cases which he has examined.

CHAPTER X.

PERICARDITIS AND ENDOCARDITIS.

History of our knowledge of rheumatic cardiac lesions—Difficulties of obtaining any exact estimate of their frequency—Period of greatest liability—The clinical associates of pericarditis—Variations in frequency of pericarditis—Liability of the two sexes—Influence of age—Physical signs of pericarditis—Morbid anatomy—The acute and fibrous varieties—Myocarditis—Endocarditis—Intra-uterine endocarditis—Relative frequency of the different valvular murmurs—Physical signs—Evanescent murmurs—Effect of endocarditis upon temperature chart—Morbid anatomy—Relation of malignant endocarditis to rheumatism—Sequelæ of endocarditis—Statistical appendix.

It is no longer necessary to bring forward arguments in support of the claims of pericarditis and endocarditis to rank as primary manifestations of rheumatism; but before the days of auscultation and percussion it was only by the occurrence of grave cardiac symptoms in the course of the rheumatic attack, or by the discovery of the lesions *post-mortem*, that the association of cardiac disease with rheumatism could be ascertained; and accordingly, it is not surprising that until the present century their frequency was not recognised. The converse observation, that many sufferers from heart-disease have passed at some former period through an attack of rheumatic fever, dates from the end of the last century, when, as we know on the authority of Baillie, Pitcairn was in the habit of impressing this fact upon his pupils at St. Bartholomew's Hospital. Lebert mentions a pamphlet by Fort Davis, whose earliest observations dated from 1785, but this pamphlet I have been unable to find. In the year 1808, Sir David Dundas recorded a number of cases of endocardial and pericardial disease originating in the course of acute rheumatism, and similar observations were published by Odier of Geneva in 1811, by Wells in 1812, and by Mathey of Geneva in 1815; and from that time the possibility of the metastasis of rheumatism to the heart was recognised in all treatises and text-

books. Bouillaud was the first to recognise the frequency of such accidents, and his great discovery, that their occurrence was the rule rather than the exception in rheumatic fever, has stood the test of all subsequent observations, and has become one of the most firmly established of the data of medicine. No doubt Bouillaud, like so many other discoverers, went too far, and was often led to form the diagnosis of endocarditis upon insufficient grounds; nor can it be doubted that he included as examples of rheumatic fever many cases of altogether different nature. But however we may criticise the observations on which his conclusions were based, the fact remains that more than half of all sufferers from rheumatic fever develop in the course of the attack endocarditis or pericarditis of greater or less severity.

To arrive at a more exact estimate than this is a matter of extreme difficulty, for although a great mass of statistics bearing upon the point has been collected, these figures are open to many sources of error. If it be a fact that the characters of rheumatism vary considerably at different periods, a proportion of cardiac affection which is true for one period will not hold good for another. Another difficulty arises from the different liability to cardiac affections at different ages, for the total proportion obtained will depend, to some extent, upon the number of children and adults respectively embraced in the totals. Diagnostic errors, due to the inclusion under the name of acute rheumatism of other articular diseases in which there is little or no liability to cardiac affection—errors which cannot be small ones in many of the older statistics—must necessarily result in the reduction of the percentage of cardiac affection below its true level. Again, authorities differ amongst themselves as to what may be justly regarded as evidence of endocarditis, and according to the views held upon this question, different proportions will be obtained. Lastly, it must be borne in mind that these statistics, like so many others relating to rheumatism, deal only with the acute and subacute articular cases, and leave altogether out of account the various abarticular forms of the disease, which are so common in children, and in which the proportion of cardiac affection reaches so high a level. As it would only be confusing to introduce a mass of statistics into the text, I have arranged an abstract of some of the most important of these in the form of an Appendix to this chapter, and shall here confine myself to the inferences which may be drawn from their study.

Pericarditis may supervene in the course of an attack of acute articular rheumatism of any degree of severity, and not infre-

quently it develops apart from any articular lesions, especially in those who inherit the rheumatic tendency; occasionally also it is associated with an attack of chorea or of erythema without joint-lesions. When it forms part of an attack of rheumatic fever, it may precede the arthritis by several days, but more commonly it begins after the disease is thoroughly established.

Sir William Gull and Dr. Sutton found that, in cases which were practically untreated, the tendency to cardiac affection, both of the pericardial and endocardial variety, was greatest during the early days of the attack, and lessened with each succeeding day of the illness. They found that, as a rule, the heart escaped entirely if it were not attacked during the first week, provided always that absolute rest and restricted diet were insisted upon. How far the special liability during the earliest days of the attack, depends upon the fact that the patient is not kept absolutely at rest, it is difficult to say. Other observers mention the second week of the fever as the most usual period for the development of pericarditis, and the cases recorded by Gull and Sutton would seem to give an unusually low estimate of the danger of cardiac affections after the patient's admission to a hospital.

Pericarditis occupies a somewhat peculiar position among the rheumatic lesions, for many of the less common manifestations of the disease are far more apt to occur in cases in which the pericardium is involved than in those in which it escapes. This is especially true of pneumonia and pleurisy, of hyperpyrexia and of nephritis, and it might readily be supposed that the relation of pericarditis to these accidents is one of cause and effect; but although such association is the rule, it is by no means invariable, and each of the above-mentioned lesions is met with in cases in which the pericardium is not affected at all. It is possible that we are here dealing merely with examples of the law that similar rheumatic lesions are apt to occur in clinical association, but whether this is the case or no, it would seem that the occurrence of pericarditis affords an indication of some peculiarity in the character of the attack, which shows itself in a tendency to the implication of many different structures. In default of a better word, this peculiarity may be styled *malignancy;* but it has no necessary connection with any special intensity of the febrile disturbance, nor with any exceptional severity of the articular lesions. This view of the matter receives support from certain observations made by the committee of the Clinical Society which was appointed to investigate the subject of hyperpyrexia. In their report it is shown that not only is rheumatic hyper-

pyrexia associated with pericarditis in a large proportion of the cases, but also that when hyperpyrexia is unusually prevalent, pericarditis is developed in an unduly large proportion of the cases in which no cerebral symptoms are observed.

Variations of Frequency.—In an earlier chapter I have already referred to certain observations showing the varying frequency of pericarditis at different times, and especial stress was laid upon those of Lange and Fetkamp; similar variations have been noticed by a number of other observers. In 1845 Taylor wrote as follows:—"All the five severe cases of pericarditis occurred between the 1st of April and the 5th of October 1844, and it was remarked at the time, that the disease was observed much more frequently than usual, during the period referred to." Besnier also says, "Can we forget, on the other hand, that whatever be the characteristics of the patients, the cardiac localisations of acute rheumatism are notably less frequent or less grave at certain epochs than at others?" and Senator speaks very positively of the variations in the frequency of heart-affections in general, which he ascribes to a genius epidemicus or endemicus. Dr. Church, too, remarks that pericarditis is apparently less frequent now-a-days than it was twenty years ago. When the statistics bearing upon the frequency of pericarditis are compared together, it is seen that the figures range, for the most part, between 10 and 20 per cent. of all cases of rheumatic fever, and it is probable that no nearer estimate of so variable a proportion is possible.

Observers have arrived at very different conclusions as to the relative liability of the two sexes to pericarditis. The statistics of Fuller and those of the Collective Investigation Committee of the British Medical Association give an excess of female patients, but the valuable statistics of Dr. Church, which embrace a large number of cases, all of which had been under his own care, show a much larger proportion of males than females. Fuller, Church, and the Collective Investigation Committee agree in recognising a decreasing liability with advancing age. In children under fifteen, Fuller met with pericarditis in 36.36 per cent. of the cases, and Church and the Collective Investigation Committee give 24 and 25 per cent. respectively as the proportion in children under ten years of age.

Physical Signs and Symptoms.—The physical signs and symptoms of pericarditis are so familiar, and are so accurately described in many works on diseases of the heart, that it is unnecessary to do more than allude to them here. In many rheumatic cases a

friction-sound, commencing at the cardiac base, and gradually spreading over the whole precordium, is the only sign observed. This sound is increased by pressure with the stethoscope, and is often brought out, by such means, in places outside the limits within which it is otherwise audible. There is often only a slight modification of the heart-sounds at first, to which the name of *stickiness* has been aptly applied, and which develops later into a distinct to-and-fro rub; and in some rare cases the friction-sound has at times a character which is best compared to the noise produced by crumpling paper. Precordial pain, increased by pressure over the sternum or upwards upon the diaphragm, is usually a well-marked symptom. The more severe symptoms, such as dyspnœa with dilating alæ nasi, extreme rapidity of the pulse, and sometimes dysphagia, are best seen when there is considerable serous effusion, evidenced by an increase of the cardiac dulness, especially in the upward direction; the distant and muffled character of the cardiac sounds, and the feebleness or absence of the apex-beat.

Morbid Anatomy.—The *post-mortem* appearances observed in the slighter forms are hyperæmia of the membrane and the effusion of fluid into the underlying tissues. In more advanced cases there is an exudation of plastic lymph, which is deposited in layers upon the surface of the pericardium, and which may present a shaggy appearance owing to the unceasing activity of the heart. When the inflammation has been prolonged, as in cases which Dr. Cheadle describes, there may be considerable fibrous increase, and Drs. Barlow and Angel Money have met with thickenings of the pericardium which resemble in structure the subcutaneous nodules. The effused fluid is usually clear, but may be tinged with blood, and some observers have found it to be more acid in reaction than that poured out as the result of serous inflammations of other than rheumatic origin.

Dr. Cheadle has pointed out, that although the most acute forms of the disease are occasionally met with in children, the pericarditis of childhood has usually a more insidious character, and the considerable rise of temperature, which usually marks the onset of acute pericarditis, is absent in such cases. This form of the affection is often associated with the development of subcutaneous nodules, and, in spite of its subacute character, is apt to be attended with the most disastrous results. To quote Dr. Cheadle's own words: "The pericardial rub continues or subsides after a few days, to reappear again after an interval perhaps, or, although it never reappears, the rapid action of the

heart continues, in spite of digitalis, strophanthus, or ergot; fresh nodules come out; the area of cardiac dulness increases, and there is muffling of the sounds over the mid-cardiac region, but no signs of effusion; the heart is clearly growing more bulky, and the pericardium thicker, and emaciation and anæmia proceed apace. The child daily grows more pallid, weak, and wasted; the pulse grows more feeble; and so, without extreme dyspnœa or dropsy, the patient sinks slowly from exhaustion or heart failure." In cases of this nature, the membrane is found greatly thickened, its surfaces are glued together by copious lymph, and the affection may even spread to the tissues of the anterior mediastinum. Dr. Cheadle holds that the tightening grip of the thickened and contracting pericardium, with possibly a concurrent myocarditis, is one of the most potent causes of the fatal ending, and quotes an instance in which death occurred from this cause many years after the rheumatic attack which gave rise to the morbid changes in the membrane.

Myocarditis.—The onset of myocarditis, which is often due to an extension of the inflammatory process from the pericardium, cannot be diagnosed with any degree of certainty, but its presence may be suspected when, in the course of an attack of rheumatic fever, the first sound of the heart becomes feeble, and the signs of cardiac dilatation and failure are observed.

Endocarditis.—Endocarditis is a far more common rheumatic lesion than pericarditis, and it has seldom any other than a rheumatic origin. There is, as has been already stated, good reason for believing that, like pericarditis, endocarditis may occur as a solitary manifestation of the disease. The liability to endocarditis decreases with advancing age, and apparently no period of life is too early for its development. Indeed, there is considerable evidence to show that it may occur during intra-uterine life, and that it is the cause of some of the varieties of congenital heart-disease. Dr. Goodhart has recorded instances in which congenital heart-disease was met with in children of rheumatic parents. In one case, the child of a woman, who had passed through no less than seven attacks of rheumatic fever, was born cyanosed, and with a loud systolic murmur, best heard in the pulmonary area. In this case there was probably stenosis of the pulmonary orifice, which is the commonest of the congenital lesions, and which prevents the complete closure of the septum between the ventricles. In a second instance, an infant, whose father had suffered from rheumatic fever, had signs both of mitral and tricuspid disease from its birth. M. Peter also records a

case in which the presence of a loud murmur in the fœtus was recognised before labour, and the infant, which died during birth, was found to have endocarditis and incompetence of the tricuspid valve. In order that a definite solution of the question whether rheumatic endocarditis actually occurs during intra-uterine life may be arrived at, it is most important that careful inquiries should be made into the family history of all children who suffer from congenital heart-disease, for in such cases the argument from heredity is the only one available. The enormously greater liability of the left side of the heart to endocarditis is usually explained by referring it to the harder work which it has to do, and this explanation receives support from the fact that in fœtal life, when the greater part of the work is thrown upon the right heart, the pulmonary and tricuspid valves chiefly suffer.

Female patients are much more liable to develop mitral murmurs in the course of rheumatic fever, whereas aortic murmurs are chiefly heard in males; but since mitral murmurs are much commoner than aortic, the total incidence of endocarditis is greater in the female sex. In the great majority of cases the murmurs developed during the attack are mitral and systolic, and according to the Collective Investigation Report, such murmurs are more than twice as common as all others put together.

Period of Onset.—Endocarditis may commence at any period in the course of rheumatic fever, and its presence may often be detected at the very commencement, at the time when the patient is first seen; nor is it unlikely that in a considerable number of instances the lesion may exist for some time without manifesting itself by any appreciable physical signs. If this is the case, it is obviously impossible to arrive at any satisfactory notion of the ordinary time of its commencement. Some observers have held that the endocardium is most apt to suffer when the fever and arthritis are severe; but others, amongst whom is Dr. Sansom, hold the opposite view, and there can be no doubt that it may be involved in the mildest cases, especially in the course of the abarticular rheumatism of children.

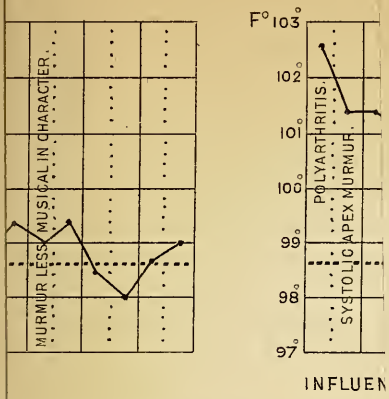
Physical Signs.—It is in no way remarkable that the physical signs of endocarditis should be obscure in the earlier stages, for no murmurs can be produced thereby unless the changes in the valves either prevent their complete closure, or are sufficient to produce narrowing of the orifice. Prolongation of the first sound of the heart is a sign upon which stress has been laid by a number of observers, and is one which is very frequently

observed before the development of an actual murmur. Dr. Sansom attributes this change in the character of the first sound to the impairment of the valvular element concerned in its production; "the curtains of the valves being swollen, the flap of their closure is rendered less manifest; the ear consequently perceives, for the most part, the muscular element of the systolic sound." Before long the prolongation of the first sound is followed by the development of a soft, blowing, systolic apex-murmur, which in the early stages is often inaudible when the patient is in the erect posture, but is brought out on lying down. Another sign upon which Dr. Sansom has laid particular stress is a reduplication of the first or second sound, and this observer has found that when this sign is present the ultimate lesion tends to be mitral stenosis rather than regurgitation. He attributes the first of the two sounds to the closure of the semilunar valves, the second to the sudden tension of the mitral flaps as the ventricle relaxes. Dr. Cheadle, who agrees with Dr. Sansom's views as far as the reduplication of the second sound at the apex is concerned, does not consider reduplication heard elsewhere as of equal importance. He is inclined to attribute the second of the two sounds to the springing back of the swollen and rigid mitral flaps, which have their chordæ tendineæ shortened. The murmurs are by no means always permanent, and their disappearance after a time is often ascribed to the subsidence of an endocarditis, which, while it lasted, rendered the valve incompetent; a view which is supported, as Dr. Cheadle points out, by the regularity with which the subcutaneous nodules disappear; which suggests that if only the heart could be kept at rest, the analogous thickening and cell-proliferation of the endocardium would in like manner disappear, but not without leaving behind permanent damage of the valves in many cases. Some have suggested that such disappearing murmurs are in reality of hæmic origin; but against this are the facts that they are frequently heard at the angle of the scapula, and may even have a distinctly musical character. Dr. Sansom has also found that systolic murmurs, best heard at the cardiac base, are almost confined to first attacks of rheumatic fever, and that evanescent rheumatic murmurs are, as a rule, apical. He suggests that these murmurs may possibly have their origin in a localised myocarditis, and that the weakness of a part of the muscular wall renders incompetent, for a time, the swollen valve, which is completely closed under ordinary circumstances. Whatever be the true explanation, it is certain that the disappearance of a murmur does not necessarily imply complete recovery of the affected valve,

for the lost murmur may be, after a time, replaced by a permanent one, due to fibroid changes taking place in the damaged structures. The onset of endocarditis has no very marked effect upon the temperature-curve in rheumatic fever, and when it occurs as an isolated lesion, the febrile disturbance is usually trifling. (Chart IV., fig. 1.)

Morbid Anatomy.—Rheumatic endocarditis does not attack the entire lining membrane of the heart, but is almost limited to those portions of the endocardium which are supported by fibrous structures, and which are constantly brought into contact with each other by the action of the organ. Swelling is one of the earliest effects of the process, which swelling is not confined to the endocardium itself, but extends through the entire thickness of the affected valves. Vegetations chiefly form upon those portions of the diseased valves which come in contact with each other during closure, as is well seen in the rows of minute beads which in recent cases so frequently form festoons upon the aortic flaps, but they are by no means confined to such situations. These overgrowths are produced by the proliferation of the fibrous tissue of the valve, and both the vegetations and the tissues of the valves themselves become infiltrated with leucocytes. Ziegler describes the surface-layers of the fully-developed vegetations as consisting of granular and fibrinous masses, which are for the most part merely coagulated exudations, and speaks of the process as an exudative inflammation, in which the exudation permeates the tissue, and is in part coagulated. "Where coagulation takes place, the tissue undergoes necrosis; where there has been only an infiltration of leucocytes, the tissue persists." Other observers hold that what appears to be a layer of coagulated exudation upon the surface of the vegetation is in reality a fibrinous deposit from the blood which circulates over the inflamed area. It is the affection and active proliferation of the sub-endothelial fibrous tissue which gives rise to the swelling and thickening of the valve flaps; and it is this process which is analogous, as Drs. Barlow and Warner first pointed out, to the changes in the subcutaneous fibrous tissues which result in nodule formation. I have already had occasion to refer to the observation of Klebs as to the presence of micrococci in rheumatic endocarditis.

Malignant Endocarditis.—It sometimes happens that, even in the course of an acute attack of rheumatic fever, the endocarditis takes on a malignant or ulcerative character; the temperature-chart assumes a septic type, with rigors; rapidly changing murmurs are developed; and emboli become lodged in various organs, such as the brain, spleen, or kidneys. More commonly



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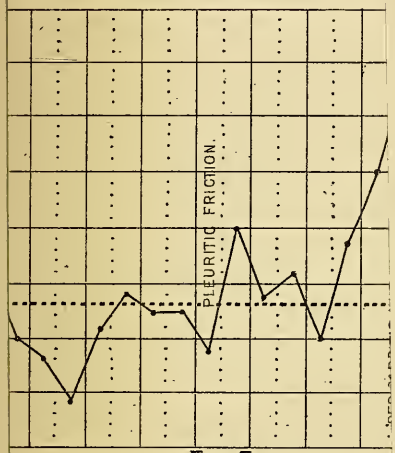
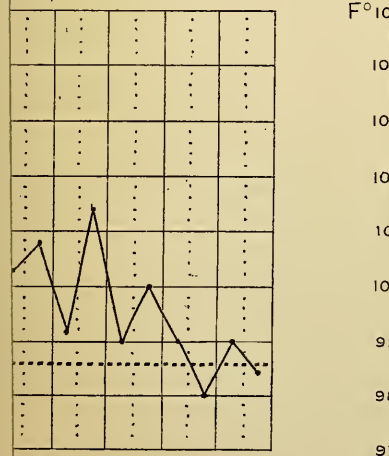


FIG. 3.
INFLUENCE OF PERICARDITIS.



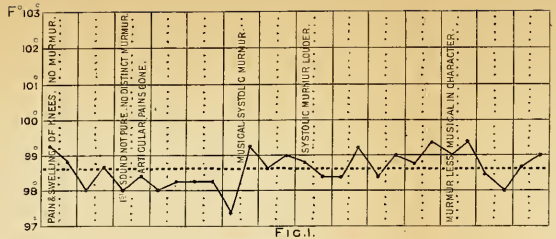


FIG.1.
RHEUMATISM IN A CHILD.

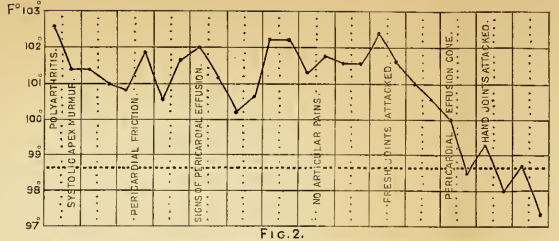


FIG.2.
INFLUENCE OF PERICAROITIS UPON THE TEMPERATURE CURVE OF RHEUMATIC FEVER.

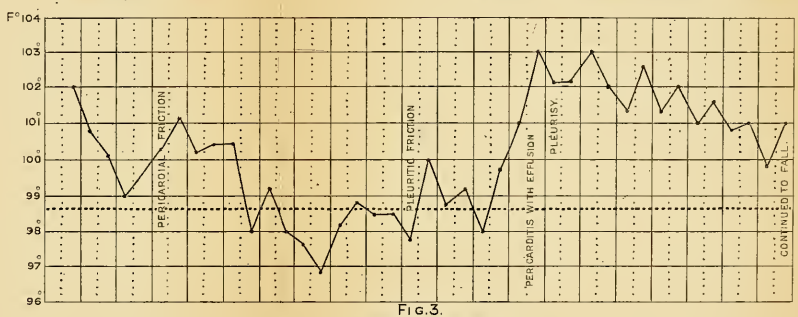


FIG.3.
INFLUENCE OF PERICAROITIS.

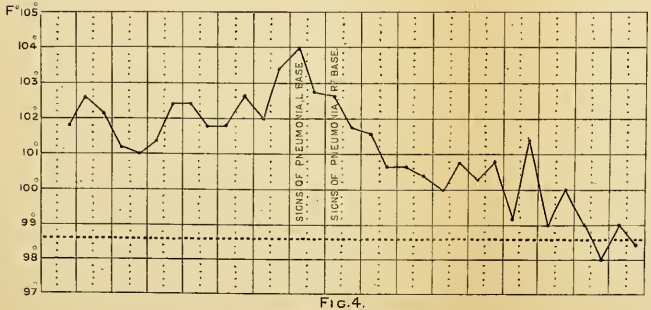


FIG.4.
INFLUENCE OF PNEUMONIA.

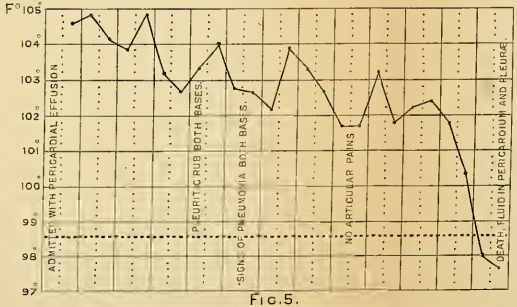


FIG.5.
RHEUMATIC FEVER WITH PERICARDITIS, PNEUMONIA AND PLEURISY.

the association of this condition with rheumatism is more remote, the malignant changes developing in valves which have been left damaged by an attack of rheumatic fever many years previously. Dr. Osler went over the records of 209 cases of malignant endocarditis, and found a history of rheumatism, past or present, in fifty-three cases. In twenty-four of these the symptoms were developed in the course of an acute or subacute attack; in twenty-nine there was merely a history of rheumatism at some previous time. In the present state of our knowledge, it is impossible to formulate the relationship between the malignant and the simple rheumatic endocarditis, or to be sure whether the malignant process, when it occurs in the course of an acute rheumatic attack, is merely an intensification of the milder form, or an entirely secondary accident of the disease. The latter view seems to receive support from the observed fact that ulcerative changes are especially apt to attack damaged valves, even in the absence of any evidence of renewed activity of the rheumatic process.

Sequelæ of Endocarditis.—The sequelæ of endocarditis constitute by far the most serious of the after effects of rheumatism, but it would obviously be out of place to enter here upon any discussion of these sequelæ, for the subject of valvular disease and its results forms a very large and important part of the science of medicine. The shrinking and induration of the valve curtains and their tendons, and the hypertrophy and dilatation of the cardiac walls to which these changes give rise, interesting as they are, owe their chief importance to the mechanical disturbance of the circulation to which they give rise, and to the disastrous results of such disturbance, rather than to their so frequent origin in a rheumatic inflammation. Suffice it to say, that chronic sclerotic changes in the valves may continue long after the specific rheumatic process has come to an end, and that it is therefore most important to give the heart as much rest as possible for a long period after an acute attack.

APPENDIX TO CHAPTER X.

THE STATISTICS OF RHEUMATIC CARDIAC AFFECTIONS.

I. General Statistics.

Peter Mere Latham.—"Diseases of the Heart," p. 83.

136 cases observed in St. Bartholomew's Hospital during the years 1836-40.

Endocarditis alone in	63 cases
Pericarditis alone in	7 „
Endo- and pericarditis in	11 „
Seat of lesion doubtful in	9 „
Total with heart-affection	90

Bamberger.—*Lehrbuch der Krankheiten des Herzens*, 1857, pp. 110 and 159.

Estimates the proportion of pericarditis at about 14 per cent.

Estimates the proportion of endocarditis at 20 per cent.

Lebert.—*Klinik des akuten Gelenkrheumatismus*, 1860.

Total cases of rheumatic fever, 140 :—

Systole not pure in	35 cases
Endo-pericarditis in	20 cases or 14.3 per cent.
Pericarditis alone in	9 „ 6.4 „
Endocarditis alone in	4 „ 2.8 „

Total percentage of definite heart-affection 23.5.

Peacock.—"St. Thomas's Hospital Reports," New Series, vi., 1875.

Total number of cases, 233 :—

Pericarditis in	36 cases or 15.45 per cent.
Endocarditis in	39 „ 16.7 „
Total percentage	32.15

Valleix.—*Mém. de la Soc. Méd. d'Observation*, vol. iii., 1856, p. 22.

Met with abnormal bruits in 77 cases out of 214, of which he regarded 24 only as cases of veritable heart-disease.

Endocarditis in	1 case in 35.
Pericarditis in	1 „ 15.
Endo-pericarditis in	1 „ 9.

Taylor.—"Medico-Chirurgical Transactions," vol. xxviii., 1844-45, p. 482.

75 cases observed between 1841 and 1844.

Total with heart-affection, 37.

Of these—

Pericarditis in 8.

Doubtful pericarditis in 2.

Valvular disease, old or new, in 30.

Certainly recent in 2.

Doubtfully recent in 2.

Sibson.—"Reynolds' System of Medicine," vol. iv., 1877.

326 cases admitted to St. Mary's Hospital between 1851 and 1866.

Cases of acute rheumatism with pericarditis	63
(in 54 of these endocarditis was also present)	
Cases with simple endocarditis	108
Cases with threatened or probable endocarditis	76
Cases with no signs of endocarditis	79

Fuller.—"Rheumatism, Rheumatic Gout, and Sciatica," 3rd edit., p. 280.

379 cases of acute and subacute rheumatism admitted to St. George's Hospital between 1845 and 1848.

Heart affected in	187 cases
Heart not affected in	160 „
Not noted in	32 „

In 130 cases the heart-affection was recent.
In 13 of which, there was pericarditis only.
In 28 endo- and pericarditis.
In 89 endocarditis only.

Pye Smith.—"Guy's Hospital Reports," 3rd series, vol. xix., 1874.

Total number of cases, 400. Dates, 1870–1873 inclusive.

Pericarditis alone in	70	
„ with large effusion	4	
„ with endocarditis	17	
„ with pleurisy	5	
Total pericarditis	——	96
Systolic bruit audible at base	20	
„ „ at apex	3	
„ seat not stated or præcordial	11	
Total murmurs not certainly organic	——	34
Mitral bruit audible at apex and axilla	78	
Aortic bruit, diastolic or double	16	
Præsystolic bruit	3	
Total of organic murmurs	——	97

Total of cases with auscultatory evidence of cardiac affection, 227

Church.—"St. Bartholomew's Hospital Reports," 1887, vol. xxiii.

Total number of cases, 693:—

Heart affected in	371
Heart not affected in	203
Heart doubtful in	12
Condition not stated in	107

Percentage of heart-affection in cases fully noted, 63.182
Percentage of pericarditis 10.670

Samuel West.—"Practitioner," 1888, vol. xli.

Total number of cases, 1107, occurring in St. Bartholomew's Hospital, 1881–86.

Heart affected in	742 or 67.03 per cent.
Heart not affected in	365 or 32.97 „

Pericarditis only in	78 cases.
Pericarditis and mitral disease in	83 „
Valvular disease in	648 „
Myocarditis in	3 „

Hirsch.—*Mittheilungen aus der Med. Klinik zu Wurzburg*, ii., 1886, p. 305.

Of 175 cases, heart affected in 91.
Of 112 first attacks, heart affected in 58 or 51.7 per cent.

Endocarditis in	41 or 36.6 „
Endo-pericarditis in	14 or 12.5 „
Pericarditis in	3 or 2.6 „

Whipham.—Report of the Collective Investigation Committee of the British Medical Association. *British Medical Journal*, 1888, vol. i. p. 387.

Total number of cases, 655.

Pericarditis alone in	54 or 8.24 per cent.
Endo-pericarditis in	57 or 8.70 „
Total pericarditis,	111 or 16.94 per cent.

Statistics based upon small numbers of cases are also given by—

Ormerod.—Medico-Chirurgical Trans., xxxvi. 1853, p. 4.
Leudet.—Archives Gén. de Méd., 1862, p. 8.
Budd.—Tweedie's Practical Medicine, v. p. 195.

Summary of the Percentages of Pericarditis.

Latham	13.23
Bamberger	14 about.
Lebert	20.71
Peacock	15.45
Pye Smith	24.00
Church	10.67
S. West	14.54
Fuller	10.81
Sibson	19.63
British Medical Association	16.94
Hirsch	15.1
Mean percentage	15.19

Pericarditis Alone and Associated with Endocarditis.

Influence of Sex.

Percentage of Cases in which Pericarditis was Developed.

Observer.	Male.	Female.
Latham	13.33	13.11
Fuller	8.07	14.74
Church	14.23	7.23
S. West	14.21	14.09
Whipham	14.66	20.07

Influence of Age.

Percentage of Cases in which Pericarditis was Developed.

Age.	Fuller.	Church.	Whipham.
Under 10 years.	...	24.00	25.00
10–15 „	36.36	...	...
15–20 „	18.29	10.20	19.38
20–25 „	9.78	...	...
25–30 „	6.31	12.01	15.48
30–35 „	5.00	...	...
35–40 „	3.57	8.08	14.88
40–45 „	6.66	Over 40 years. 8.36	...
45–50 „	...	...	20.00
50–55 „	...	...	Over 50 years. 3.85

Endocarditis, Old and Recent.

Influence of Sex.

Samuel West.—

	Percentage in Males.	Females.
Aortic	9.16	4.66
Mitral	50.8	67.76

Fuller.—

Males	41.43 per cent.
Females	51.92 „

Murmurs Developed during Attacks.

Whipham.—

Aortic systolic	9
„ diastolic	2
Mitral systolic	56
„ præsystolic	6
In pulmonary area	3
Endocarditis	1

Influence of Age upon Total of Heart-Affection in First Attacks.

Church.—

Percentage of Heart-Affection in Cases fully Noted.

Under 10	55.05
„ 20	67.44
„ 30	54.52
„ 40	31.18
„ 50	50.00

Hirsch —

Ages.	No. of Patients.	Heart-Affection in	Percentage.
11–15	1	0	0.0
16–20	37	19	52.8
21–25	38	23	65.3
26–30	16	8	50.0
31–35	6	5	83.3
36–40	4	0	0.0
Over 40	10	3	30.0

Liability in Different Attacks.

Church.—

Percentage of Heart-Affection.

First attacks	56.16
Second attacks	75.00
Third and later attacks	68.80
Number not stated	55.10

Samuel West.—

Percentage of Cases which Escape without Heart-Disease

First attack	41.2
Second attack	24.7
Third attack	20.8
Fourth and later attacks	18.1
Number not stated	40.9

Origin of Valvular Disease.

Goodhart.—"Diseases of Children," 1886, p. 556.

248 cases of valvular disease in early life.

	Females.	Males.	Total.
After rheumatism	89	45	134
Choreic	45	14	59
Other	33	22	55

Nature of Lesion.	Rheumatic.	Choreic.	Non-Rheumatic.	Total.
Mitral	79	39	29	147
Aortic	3	7	1	11
Aortic and mitral	8	11	3	22
Doubtful	44	2	10	56
Congenital	0	0	12	12

CHAPTER XI.

PNEUMONIA AND PLEURISY.

Frequency — Association with pericarditis — Pleurisy by extension — Rheumatic pleurisy usually left-sided—Pericarditis usually precedes pleurisy—Character of rheumatic pleurisy—Rheumatic pneumonia also usually left-sided—Sometimes secondary—Dr. Sturges' views—The predominance of left pneumonia not merely due to cardiac lesions—Symptoms of rheumatic pneumonia—Physical signs—Transitory character—Hepatisation sometimes observed—Acute œdema of the lungs—Bronchitis—Absence of relation between bronchitis and cardiac lesions.

In the course of a disease such as rheumatic fever, in which any movement causes suffering to the patients, it is often impossible to carry out any routine examination of the back of the chest, and it is therefore probable that the development of pulmonary lesions is sometimes overlooked. This is the more likely to be the case because the pain of pleurisy may pass unnoticed when there are so many other pains complained of, and because rheumatic pneumonia is not, as a rule, attended by the ordinary symptoms of that condition. Nevertheless, in a considerable number of cases of rheumatic fever, inflammatory lesions of the lungs or pleuræ are observed ; far less commonly, it is true, than endocarditis or pericarditis, but still with sufficient frequency to justify their inclusion among the more important accidents of the rheumatic state. The frequency with which such lesions occur has been very differently estimated, and the various observers who have made statements as to this point do not even agree as to the relative frequency of pneumonia and pleurisy, as may be seen by reference to the following table, which embodies some of the more important statistics which have been collected with a view to throwing light upon these questions :—

Author.	Total Cases of Rheumatic Fever.	Total Pleurisy.	Total Pneumonia.	Percentage of Pleurisy.	Percentage of Pneumonia.
Latham	136	3	18	2.20	13.23
Fuller	246	13	28	5.28	11.38
Wunderlich . . .	108	5	7	4.63	6.48
Pye Smith	400	18	7	4.50	1.75
Lange	1888	124	...	6.51	...
Collective Investigation .	655	13	11	1.98	1.52

Of one fact there is no doubt, namely, that both pneumonia and pleurisy are much more apt to occur in cases in which the heart has been attacked than in those in which it has escaped damage.

Fuller met with :—

		Per cent.
1 case of pneumonia amongst	127 cases with no recent cardiac mischief	= 0.78
4 cases of pneumonia 2 cases of pleuro-pneumonia	amongst 80 cases with recent endocarditis alone	= 7.77
4 cases of pneumonia 1 case of pleurisy 2 cases of pleuro-pneumonia	amongst 12 cases with recent pericarditis alone	= 58.3
10 cases of pneumonia 3 cases of pleurisy 5 cases of pleuro-pneumonia	amongst 27 cases with recent endo- and pericarditis	= 66.66

Latham found :—

4 cases of pneumonia amongst 46 cases with no recent cardiac mischief.
5 cases of pneumonia amongst 63 cases with endocarditis.
4 cases of pneumonia amongst 7 cases with pericarditis.

4 cases of pneumonia 2 cases of pleurisy 1 case of pleuro-pneumonia	amongst 11 cases with peri- and endocarditis.

Pericarditis was present in seven of Dr. Pye Smith's eighteen cases of rheumatic pleurisy, and the statistics all show that the liability of pneumonia and pleurisy is much greater in cases in which the pericardium is involved than in those in which the endocardium alone suffers. This fact is open to several interpretations. Either we may suppose that pleurisy and pneumonia are results of the direct extension of the inflammatory process from the inflamed pericardium, or that the cardiac affection acts, through the disturbance of the circulation which it produces, as the predisposing cause of the pulmonary troubles, the actual exciting cause of which is the rheumatic poison. Again, the

presence of cardiac affection, and especially pericarditis, may be looked upon as an indication of a special tendency to visceral lesions; or, lastly, the occurrence of pneumonia may be attributed to the mechanical effects of a large pericardial effusion.

Pleurisy.—There is good reason for believing that in not a few instances the inflammation does actually extend from the pericardium to the neighbouring pleura, for the pleuritic friction is often first detected in the immediate neighbourhood of the cardiac area. This view receives further support from the facts that rheumatic pleurisy is, as a rule, left-sided, at least in its earlier stages, and that the left pleura is in contact with the pericardium over a far larger surface than the right. Lange observed that amongst 124 cases of rheumatic pleurisy, there were 49 in which the left pleura, and only 15 in which the right pleura, was alone attacked; also among 60 cases in which both pleuræ were involved, the left was first attacked in 18, the right in 4, and both simultaneously in 38. Moreover, when the sequence of events can be traced, it is usually found that the pericarditis has preceded the pleurisy, and at *post-mortem* examinations it has been found that the part of the pleura which is in direct contact with the pericardium is that in which the inflammatory process was most intense. On the other hand, the occurrence of pleurisy in cases in which the pericardium is not affected shows that all rheumatic pleurisy cannot be ascribed to extension, and suggests that the pleura, like the pericardium, may be the seat of a primary rheumatic affection. In some instances, indeed, pleurisy is the earliest event in the rheumatic series. Occasionally this lesion appears to be secondary to the rheumatic, as to other varieties of pneumonia.

In its clinical features rheumatic pleurisy does not in any way differ from the ordinary form, nor is there anything peculiar in the *post-mortem* appearances. In the majority of instances the inflammatory process does not go beyond the dry stage, in which a friction-sound, with perhaps some impairment of resonance, are the only physical signs, and there is merely an exudation of plastic lymph upon the surfaces of the pleura. More rarely serous effusion of greater or less volume is present.

Pneumonia.—Rheumatic pneumonia, like pleurisy, is especially apt to be left-sided, and no satisfactory explanation of this reversal of the ordinary tendency of the affection has as yet been advanced. Very probably in some cases the consolidation of the left lung has its origin in the actual compression which results from a large accumulation of fluid in the pericardium,

or from great hypertrophy of the heart itself. Dr. Southey has recorded some instances in which the condition was apparently due to this cause, but it often happens that, although pericarditis is present and the left lung exhibits signs of pneumonia, there is no evidence of effusion into the pericardium, and it is obvious that, for such cases, some other explanation must be sought. Dr. Sturges has suggested that the obstruction to the circulation which results from imperfect action of the cardiac valves, and the embarrassment of the heart in pericarditis, favour the pouring out of exudation into the alveoli of the lungs; and that in rheumatism, owing to the highly fibrinous condition of the blood, this exudation will tend to consolidate with unusual rapidity. This explanation, which accounts for the very rapid development of the signs of pneumonia and the frequent absence of its characteristic symptoms, does not pretend to explain the special liability of the left lung. If embarrassment of the circulation favoured the development of left rather than right pneumonia, the same liability should be manifested in non-rheumatic attacks occurring in patients who are sufferers from old-standing heart-disease; but apparently this is not the case. I find that amongst the 1066 cases of acute pneumonia embodied in the tables of the Collective Investigation Report on that disease, there were ten in which the presence of valvular lesions was noted. Amongst these there were four in which the pneumonia was double, and the order of invasion was not stated; five in which the right lung was affected, and only one in which the disease was confined to the left side. It is also interesting to note that, of twenty-two patients who had suffered at some previous time from rheumatic fever, seven had left, ten right, and five double pneumonia.

In many other important respects rheumatic pneumonia differs from the specific disease with which the name "pneumonia" is usually associated. These differences are chiefly noticeable in the symptoms, and in the course of the febrile disturbance. There is an entire absence of the critical fall of temperature, and although the presence of pericarditis, or the intensity of the arthritis may mask the pneumonia-curve, the extension of the disease to the lung is in most instances marked by a rapid rise of temperature, followed by a gradual fall. (Chart IV., fig. 4.) Sometimes, indeed, in the rapidity with which the physical signs clear up, rheumatic pneumonia manifests something of that transitory character which is so characteristic of rheumatic lesions. Cough is often entirely absent, and rusty sputum is rarely observed,

nor is there usually any sputum at all. The physical signs do not differ in any marked way from those of consolidation of the lung from other causes, while the omission of the first stage, and the absence of initial crepitation, upon which Dr. Sturges lays stress, are by no means invariable.

M. Besnier believes that "rheumatic pneumonia," which rapidly disappears, is not pneumonia in the strict sense of the term,—that is to say, an exudative inflammation of the lungs,—but is a pseudo-pneumonia, a pulmonary engorgement or splenisation; and that the presence of crepitant râles and bronchial breathing is not sufficient, in the absence of the characteristic expectoration, to establish the presence of inflammatory changes in the lung. Ormerod also mentions, as one of the distinctive characters of rheumatic pneumonia, the absence of hepatisation; but it would be unsafe to argue too much from the absence of such changes in many cases, since the occasional occurrence of actual hepatisation is proved by a number of observations. The known facts point rather to the view that rheumatic pneumonia may present all the stages observed in other varieties of pulmonary inflammation, but that it has, like other rheumatic lesions, a decided tendency to stop short in the early stages, and to undergo rapid resolution.

The clinical features of rheumatic pneumonia are admirably illustrated by a series of six examples, recently recorded by Dr. Cheadle, which occurred in rapid succession in the wards of St. Mary's Hospital during the summer of 1887. This affection had been rarely seen in the hospital for some years, and Dr. Cheadle was inclined to attribute the outbreak to the unusually free ventilation of the wards during a period of exceptionally hot weather. It may be, however, that we have here merely additional evidence of the changes which occur in the characters of rheumatism from time to time. In four out of the six cases, serious valvular disease, of long standing, was present, and in the remaining two a systolic murmur was developed in the course of the attack. In no less than five cases the pneumonia followed upon pericarditis, and the interval between the development of the two lesions was, in those instances in which it could be determined, six or seven days. In each case the left lower lobe was first attacked, and in each the characteristic rusty sputum of pneumonia was absent.

Acute Pulmonary Œdema.—French physicians have described the occasional occurrence of a species of acute œdema of the lungs, causing sudden death with symptoms of suffocation. The

following description of this condition is taken from the work of M. Benjamin Ball :—

"This formidable complication apparently occurs in slighter cases of rheumatism, which have hitherto run a normal course. The onset is brusque, unexpected, and alarming, no premonitory symptoms giving warning of the approach of the storm. According to M. Houdé, it is especially in the evening or early part of the night that these accidents are met with. The first phenomenon observed is a sensation of heat and constriction of the sides of the chest. The heart's action becomes more and more rapid, respiration becomes difficult, and the horizontal position cannot be maintained. There is slight cough, often accompanied by viscid sputum streaked with blood, and true hæmoptysis may occur, as was noticed by the ancients. In spite of the great intensity of the functional disturbance, the physical signs do not afford any definite indications while the attack lasts. Percussion shows a slight degree of impairment on both sides of the chest, and on auscultation a few sibilant or subcrepitant râles are heard, and there is a slight enfeeblement of the vesicular murmur. There is sometimes bronchial breathing and bronchophony."

Death usually ensues in a few hours; but in a case described by Ball, which was under the care of Professor Charcot, the condition proved fatal in a few minutes. The *post-mortem* appearances are those of acute pulmonary catarrh. In some few instances recovery has taken place after attacks of this kind. Besnier states that this form of pulmonary engorgement is directly connected with acute rheumatism, but that its occurrence is to some extent dependent upon the presence of cardiac lesions. This is probably true also of pneumonia and pleurisy, both of which may occur in cases in which the cardiac membranes have not suffered, and cannot, therefore, be mere secondary complications of endocarditis and pericarditis. Nevertheless there is, as has been seen, much evidence to show that the presence of such lesions has an influence in predisposing to pulmonary accidents, and that they are, in some instances, the actual cause of their development.

The ordinary pulmonary manifestations of rheumatism do not, unless they are severe, materially affect the prognosis, but the chances of recovery will necessarily be considerably reduced by the occurrence of extensive, and especially of double pneumonia, or of copious pleuritic effusion.

Bronchitis.—Bronchitis is occasionally developed in the course of an attack of rheumatic fever, but, unlike pneumonia and

pleurisy, its occurrence is apparently not dependent in any way upon the condition of the heart. Indeed, Dr. Fuller's statistics show that the proportion of bronchitis was greatest among those of his patients who had no recent endocarditis or pericarditis. When valvular lesions of old standing are present, bronchitis may be looked upon as a complication of the cardiac disease, rather than as part of the rheumatic attack.

CHAPTER XII.

THE RHEUMATIC AFFECTIONS OF THE NERVOUS SYSTEM.

PART I.—*Cerebral Rheumatism—Hyperpyrexia—Rheumatic Insanity—Spinal Rheumatism.*

Early observations of cerebral rheumatism—The discovery of rheumatic hyperpyrexia—Influence of weather—Of individual peculiarities—Of age—Liability in first and later attacks—Association with pericarditis and other visceral lesions—Period of onset—Premonitory symptoms—Varieties of temperature-curve—Cerebral rheumatism without hyperpyrexia—Clinical varieties—Mortality—Morbid anatomy—Meningitis—The symptoms not simply due to the hyperpyrexia—Not secondary to cardiac lesions—Rheumatic insanity—Varieties of—Simon's views—Spinal hyperæsthesia—Rheumatic paraplegia—Possibility of mistaking spinal arthropathies for such cases—Examples.

Cerebral Rheumatism.—It has long been known that cerebral symptoms of an extremely grave character may make their appearance in the course of an attack of rheumatic fever. Such symptoms were described by Boerhaave, and by his commentator Van Swieten, as well as by Störck and Stoll; and in the works of Scudamore and his contemporaries the occasional metastasis of rheumatism to the brain is described, and examples thereof are recorded.

Among those who studied this branch of the subject in the middle of the present century, the names of Hervez de Chégoin, Bourdon, Ollivier, and Ranvier are especially deserving of mention, for their observations first placed the study of cerebral rheumatism upon a fairly satisfactory footing.

Hyperpyrexia.—In 1866 Kreuser, and in 1867 Ringer, independently discovered that in the great majority of instances the onset of cerebral symptoms is associated with a phenomenal rise of temperature; and from that time the phenomenon of hyperpyrexia in rheumatic fever has attracted general attention.

Besnier reproves British observers for having concentrated their attention too much upon the mere rise of temperature, whilst paying too little regard to the other symptoms of cerebral rheumatism; but it must be remembered that by combating the hyperpyrexia by the external application of cold, we are able to save the lives of many of the sufferers from cerebral rheumatism. With this line of treatment the names of Meding and Wilson Fox must always remain associated.

Cerebral disturbance with hyperpyrexia is one of the rarer accidents of rheumatism, but its frequency varies so much at different periods, that it is impossible to form any accurate idea of the proportion of cases in which it occurs. At one time a series of cases occurs in rapid succession, whereas at another it is hardly ever seen. Hot weather is undoubtedly favourable to the development of the condition, but that this is not the only factor controlling its prevalence is shown by the fact that in two summers which are equally hot, there may be a great difference in the number of hyperpyrexial cases. Male patients are far more liable than females, a fact which Besnier attributes to the greater prevalence of alcoholism amongst men; but other observers have been unable to discover that intemperance has any marked effect in predisposing to this class of accidents. Besnier also states that any condition which tends to render the brain unusually sensitive, not only favours the development of cerebral rheumatism, but also has some effect in determining the character which it assumes; and that in those who are liable to attacks of cerebral disturbance of any kind, the attack of rheumatism is apt to provoke an outbreak of such disturbance, which must be carefully distinguished from the symptoms directly attributable to the rheumatic state. Senator holds similar views, and finds that persons whose constitutions are weakened, and whose nervous systems are easily excited, are particularly liable to hyperpyrexia. On the other hand, a patient who is subject to epileptic attacks may remain free from fits as long as the temperature remains high in rheumatic fever; and in one remarkable case which I had the opportunity of watching in Dr. Andrew's Ward at St. Bartholomew's Hospital, the fits, which remained in abeyance as long as the temperature was high, returned with unusual and alarming frequency when the temperature was kept under by salicylate of sodium, and ceased once more when the drug was omitted. It may here be mentioned that the salicylates have themselves the power of causing delirium in certain cases, a fact which must not be lost

sight of when delirium is met with in the course of rheumatic fever.

The tendency to cerebral rheumatism varies at different ages, being greatest between twenty and thirty, during the period in which rheumatic fever is itself commonest, whilst in early childhood the condition is unknown.

The children of rheumatic parents show no special liability to hyperpyrexia, nor does a strong rheumatic tendency in the patients themselves act as a predisposing cause, for the symptoms are most commonly observed during first attacks of rheumatic fever, and after the third attack are almost unknown. This is clearly brought out by the statistics collected by the Committee which was appointed by the Clinical Society of London to investigate this subject. Of fifty-eight patients, the number of whose attacks were recorded, no less than thirty-seven, or 64 per cent., were suffering from rheumatic fever for the first time; sixteen, or 27.5 per cent., were in their second, and only five, or 8.5 per cent., were in their third attacks. On the other hand, it was found that among 1281 cases of ordinary rheumatic fever, 52.7 per cent. were first, 30.5 per cent. were second, and 10.7 per cent. were third attacks; from which it is seen that there is actually a greater liability to hyperpyrexia in first than in later attacks, and that the inequality is not simply due to the larger number of patients who come under treatment for first attacks.

The same set of statistics supplies most valuable information as to the association of cerebral rheumatism with cardiac and other visceral lesions. In nine out of sixty-four cases of hyperpyrexia, no visceral lesions of any kind were detected, a fact which in itself affords sufficient proof that the cerebral symptoms are not merely secondary results of such lesions. Of the remaining patients, a very large number were suffering from pericarditis, which lesion was present in no less than 56 per cent. of the cerebral cases, whereas amongst cases of ordinary rheumatic fever occurring during the same period, the proportion was only 28 per cent. Endocarditis was not observed with any exceptional frequency in the cerebral cases, but pleurisy, pneumonia, and albuminuria, all of which stand in somewhat the same relation to pericarditis as does hyperpyrexia itself, were observed in an undue proportion of instances.

The theory which ascribes the symptoms to a metastasis of rheumatism to the brain receives support from the occasional occurrence of cases in which, simultaneously with the onset of the cerebral disturbance, the joint-lesions disappear, and the sweat,

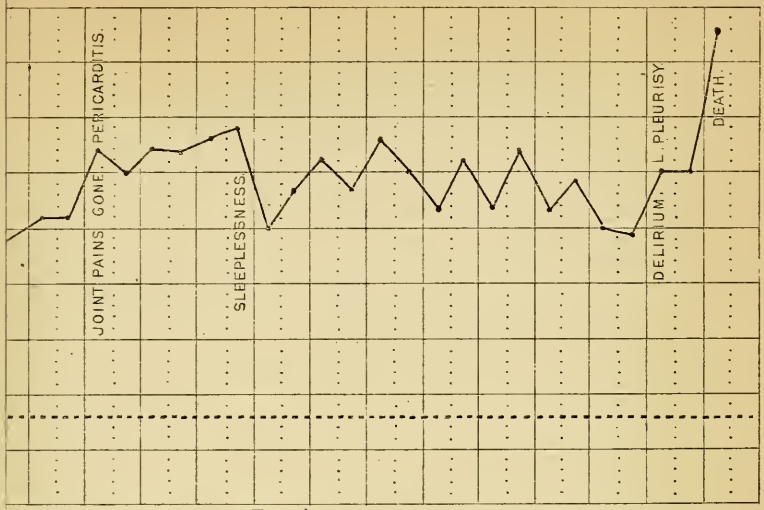
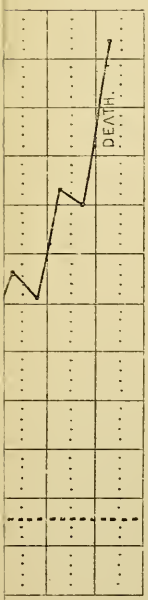
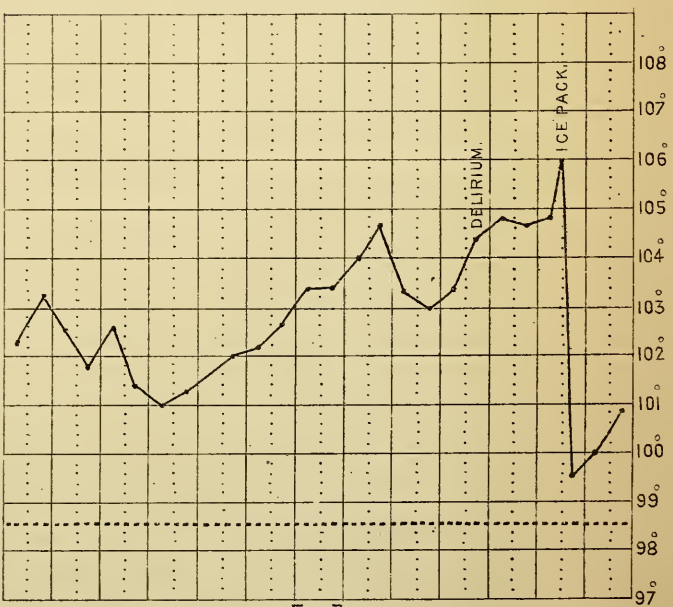


Fig. 1.
FEVER WITH CEREBRAL SYMPTOMS, TREATED ON THE EXPECTANT PLAN.





RPYREXIA,
OMMITTEE'S TYPE A.

Fig. 3.
HYPERPYREXIA; RECOVERY,
CONFORMS TO TYPE D OF CLIN. SOC. COM.

Davidson & Co. Lith.

CHART V.

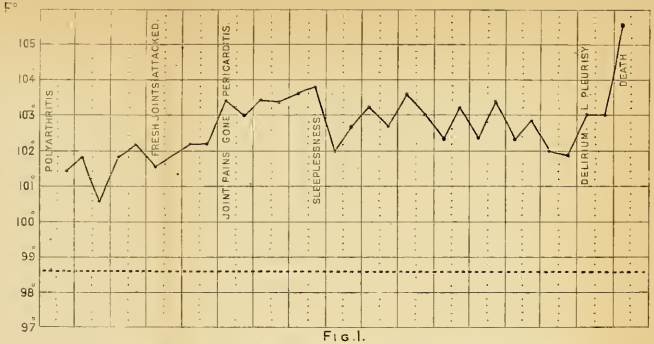


FIG. 1.
RHEUMATIC FEVER WITH CEREBRAL SYMPTOMS, TREATED ON THE EXPECTANT PLAN.

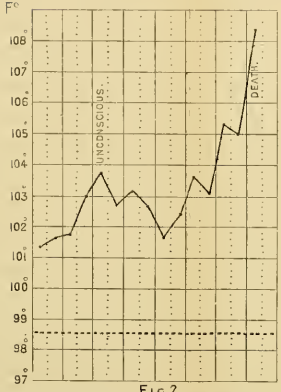


FIG. 2.
FATAL CASE OF HYPERPYREXIA,
CORRESPONDING TO CLIN. SOC. COMMITTEE'S TYPE A.

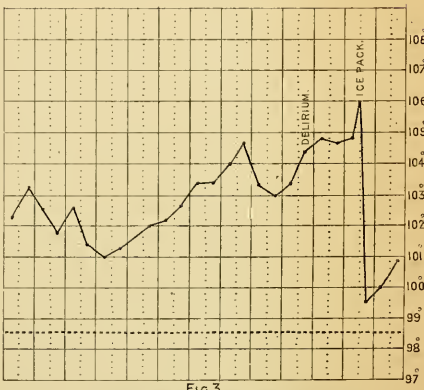


FIG. 3.
HYPERPYREXIA; RECOVERY,
CONFORMS TO TYPE D OF CLIN. SOC. COM.

Dunlop & Co. Lith.

which has previously been excessive, is arrested; but such is by no means invariably the case, and the Committee of the Clinical Society found that the joint-lesions persisted in nearly half the cases, and that dryness of the skin was noted in only about a quarter.

Period of Onset.—Cerebral symptoms may be developed at any time in the course of an attack of rheumatic fever, and cases are on record in which their onset was delayed until late in the period of convalescence, but the time of greatest liability is during the second and third weeks of the fever. The liability is by no means limited to severe attacks, and the symptoms may appear in cases which were apparently of the mildest type. The onset is sometimes extremely sudden, at others gradual, and preceded by premonitory symptoms. Delirium at night, unless it can be directly traced to the salicylates, is always an ugly sign in a case of rheumatic fever, and the same may be said of headache, sleeplessness, and cutaneous hyperæsthesia. Amongst other warning signs, excessive micturition has been noticed by Ringer, Hermann Weber, and others. The rise of temperature may be steady and gradual for a time, and there may then be a sudden elevation to an extraordinary level; or the change from a normal temperature to an extreme degree of hyperpyrexia may be very rapid. In a third class of cases there is a high range of temperature, extending over a considerable period, without any very violent exacerbations. (Chart V., figs. 1, 2, 3.)

The symptoms of cerebral disturbance may be present although the temperature never attains to any phenomenal height. In the Clinical Society's Report three cases of this kind are included. In one of these the symptoms observed were those of melancholia, followed by coma, the maximum temperature being 102.8°; the patient was suffering from a relapse after an attack of rheumatic fever, in the course of which the thermometer had at one time registered 107°. In another case the maximum reached was 104.6°, and the symptoms were coma and involuntary evacuations. When delirium is present, this symptom, as a rule, precedes the hyperpyrexia, but the two may develop simultaneously, or the cerebral disturbance may manifest itself after the temperature has already risen.

Symptoms.—For clinical purposes, the cases may be divided into three groups, according to the character of the symptoms.

In the cases of the first group, the attack commences with delirium, which may show itself simply in a strangeness of manner or wandering at night, or may assume so violent a character

that it is necessary to hold the patient down in his bed. The delirium usually passes away after a short time, and is succeeded by a condition of semi-consciousness, in which the breathing becomes irregular, the pulse is very rapid, and the eyes remain widely open, with contracted or medium-sized pupils. As time goes on, the unconsciousness gradually becomes more complete, and the patient passes into a state of deep coma, from which he can no longer be roused; at the same time the pallor of the countenance changes to lividity, and, unless active treatment is promptly carried out, the patients almost invariably die.

In the cases of the second type, the patient passes at once into a condition of coma, without any preceding stage of delirium; and how rapidly the coma may be developed is well shown by one of Dr. Ringer's original examples. The patient was a young woman, who had been convalescent for some time, and who was to have left the hospital next day. At five o'clock in the evening she was sitting up in bed; half an hour later she was found to be unconscious, and shortly after seven o'clock she died. The temperature reached 110°.

Well-marked spasmodic symptoms are the most conspicuous features of the cases of the third group; the face assumes the risus sardonicus, and a squint is sometimes developed; general convulsions are apt to occur, and in some instances the body assumes the position of opisthotonos; ultimately, as in the other varieties, coma comes on. Amongst other symptoms which have been observed in hyperpyrexial cases are muscular tremors, tendon subsultus, involuntary evacuations, deafness, giddiness, and vomiting.

Mortality.—The rate of mortality of cerebral rheumatism is very high. Among forty-six cases in which no baths were given, the Committee of the Clinical Society record twenty-two deaths and twenty-four recoveries, but in only one of the cases in which recovery took place did the temperature rise above 106°. It may therefore be concluded, that when the higher degrees of hyperpyrexia are reached, a fatal issue is almost certain unless prompt treatment is adopted. The same statistics show that early delirium is a decidedly unfavourable symptom, and that the proportion of recoveries is very low amongst cases in which no visceral lesions are present.

Morbid Anatomy.—It is quite the exception for any obvious cerebral or meningeal lesions to be found *post-mortem* in fatal cases, but cerebral anæmia or congestion and subarachnoid effusion have occasionally been observed, and more rarely actual meningeal inflammation. When the recorded instances of rheu-

matic meningitis are examined, it is seen that in many the rheumatic origin of the lesions is at least extremely doubtful, but there are a few in which the evidence is, to all appearance, conclusive. For instance, a young woman, whose case was reported by Gosset, became delirious in the course of an attack of rheumatic fever, and died in a condition of active delirium. At the autopsy, the arachnoid was found to be opaque and thickened by deposits of plastic lymph; there was great hyperæmia of the meninges, and subarachnoid effusion of considerable volume. Such cases do not in their clinical features differ, to any extent, from those in which no lesion of the brain or its membranes can be detected. In many instances there is abnormal fluidity of the blood, and this even when the temperature has been at no time excessive.

Pathology.—Three principal views have been advanced as to the nature of cerebral rheumatism. Some observers have maintained that the phenomena are secondary, and result from the cardiac lesions; others, that the nervous symptoms are due to the hyperpyrexia, whilst others again hold that the cerebral disturbance and the hyperpyrexia are alike manifestations of the action of the rheumatic process upon the nervous centres. The fact that the phenomena of cerebral rheumatism are developed in cases in which the heart has sustained no damage is in itself sufficient to prove that these symptoms are not merely secondary results of endocardial or pericardial lesions, and if the heart-affection were itself capable of giving rise to such symptoms, we should expect to meet with them more frequently than is actually the case, and not only in the course of rheumatic attacks.

The view which is advocated by Senator and others, who regard the symptoms of cerebral disturbance as due merely to the phenomenal elevation of the body temperature, is also opposed by many observed facts; for delirium and other symptoms often precede the hyperpyrexia by hours, or even days, and hyperpyrexia is itself an indication of a disturbance of the central nervous system, for the production of which it is necessary to imagine some action of the rheumatic process upon the thermic centre. Moreover, as we have seen, the other symptoms may be present, although the temperature never attains to the limit of hyperpyrexia. It would seem, then, that the observed phenomena are best explained by attributing both the delirium and the hyperpyrexia to the action of a hypothetical rheumatic poison upon the higher nerve-centres; for the only condition essential to their production is the activity or recent activity of the rheu-

matic process. Why, although rheumatic fever is so extremely common, such accidents are so rarely encountered in practice, it is at present impossible to say, but their frequency apparently depends, to a great extent, upon those unknown influences, external to the patient, which tend to modify the characters assumed by rheumatism at different periods.

Rheumatic Insanity.—Besides the graver forms of cerebral disturbance in which hyperpyrexia plays so conspicuous a part, less intense, but more lasting, mental symptoms are occasionally observed in connection with rheumatic fever. Some cases of this kind were described by Sir George Burrows in a paper on "Disorders of the Cerebral Circulation, and the connection between Affections of the Brain and Diseases of the Heart," which was published in 1846, and by M. Mesnet in 1856. Further light was thrown upon the subject by Griesinger in 1860, and by Tungel, who, in the same year, discussed this form of insanity in his *Klinische Mittheilungen*. Amongst other observers who have contributed to the knowledge of this subject the names of Ferber, Clouston, and Christian may be mentioned.

Simon, in a series of elaborate papers, collected the various recorded cases, and added others which had come under his own observation. This writer distinguishes three different forms of rheumatic insanity.

Sometimes the affection takes the form of melancholia, or even stupor, the development of which may succeed a period of more or less maniacal excitement. In other cases there is a species of alternating insanity, in which mania, melancholia, and dementia may all appear in turn, a condition which Simon distinguishes from "*folie circulaire*" by the rapidity with which the form changes, and by the absence of any lucid intervals. In the cases falling into Simon's third class, the mental condition occupies an intermediate position between insanity and dementia, and is characterised by a silly childishness.

Some of the earlier writers upon this subject thought that the insanity alternated with the joint-affection, being less marked when the arthritis was active; but this is by no means always the case, and the mental condition may even become aggravated when a relapse occurs. Simon states that the mental alienation may be noticed at the very commencement of the rheumatic attack, or when the fever is at its height, but more usually it is observed during convalescence, when the articular troubles have subsided. Choreic movements are often observed in association with this form of insanity; and Dr. Clouston, whose cases

illustrate this point, regards rheumatic and choreic insanity as of essentially the same nature. In more than half the cases collected by Simon, the heart was affected; but this author considers that it is impossible to attribute the mental disturbance to the condition of the heart alone, although he is inclined to regard cardiac diseases as favourable to its development, and mentions pain as another accessory cause.

In the great majority of instances rheumatic insanity is of short duration, lasting only some two to four months, or even disappearing entirely within so short a period as two weeks. According to Simon a longer duration than four months still allows some hope of ultimate recovery. Simon believes that this form of insanity is not a specific rheumatic affection, and concludes his paper as follows:—"It appears, then, that neither the form, nor the course of the rheumatic mental disturbances; neither their complications, prognosis, nor anatomical appearances, compel us to differentiate these forms from those which follow other acute diseases; and as I stated seven years ago, so I repeat now, after investigating twice as great a mass of material, that there is no such thing as chronic cerebral rheumatism, but that mental disturbance develops after acute rheumatism, just as it does after typhus fever or small-pox."

Spinal Symptoms.—MM. Ollivier and Ranvier have shown that in some cases of cerebral rheumatism the reflexes are abolished, and, as we have seen, other indications of spinal implication, such as opisthotonos, are sometimes present. There is, however, as yet but little satisfactory evidence of the occurrence of purely spinal symptoms in association with rheumatism. Besnier has frequently detected points of hyperæsthesia along the spinal column in cases of rheumatic fever, and when these are present, he has met with neuralgic pains in the legs, and paralysis or paresis of the bladder. Similar observations have been recorded by Dr. Judson Bury. In another class of cases, in which paraplegia is the most prominent symptom, the difficulty of diagnosis may be rendered very great, for it is now a recognised fact that lesions of the spinal cord may themselves give rise to acute arthritis, and the possibility that the joint-lesions are, in any given instance, of such a character, must render us very cautious in accepting any case of supposed rheumatic paraplegia, especially as in most of the cases diagnosed as such the heart has been perfectly normal.

How great this difficulty of diagnosis may be is clearly pointed out by Besnier, Homolle, and other recent writers, and is well

illustrated by a case reported by Dr. Stephen Mackenzie in 1883. The patient was a woman aged forty-six, whose illness commenced with a sore throat, followed by articular pains. She was sent to the hospital with the diagnosis of acute rheumatism. The joints presented very much the appearance seen in acute gout, but the serum of the blood was found to be free from uric acid, and no other gouty symptoms were present. The temperature was somewhat raised. Soon afterwards the patient began to suffer from incontinence of urine and fæces, and a small bed-sore formed over the sacrum. The muscles of the legs atrophied and gave the reaction of degeneration. Twitchings in the legs were noticed, and there were severe pains in the knees and heels, and painful ulcers in the last-named situation. After a time the temperature fell, the arthritis cleared up, the control of the bladder and rectum was regained, and the patient eventually made a satisfactory recovery. Dr. Mackenzie was inclined to regard the spinal lesion as primary in this case, and the arthritis as a secondary event.

In a case under the care of Dr. George Johnson, recorded in the *Lancet* of 1867, the patient was a young man aged twenty, with no rheumatic antecedents. A chill on October 16, 1866, was followed by general malaise, pains in the limbs, and profuse sweating, and a day or two later by swelling of the knees. When admitted to King's College Hospital on October 31, he had pain in the knees, wrists, and ankles, but no swelling of the joints. On November 6 his temperature was 103.4°, and he became delirious. On the 11th he passed urine and motions involuntarily; and on the 13th he was found to be paraplegic. The heart was normal, and in the lungs signs of bronchitis only were found. On the 28th some return of power was noticed in the legs, and by December 5 he had regained power over the bladder and rectum. The patient made a complete recovery, and was discharged well on January 2. It will be noticed that here the diagnosis of rheumatism rested only upon the presence of arthritis and profuse sweating after a chill.

In a case, fatal by coma, which was recorded by Dr. Brown Sim in 1887, there was a strong rheumatic family history, and the patient had suffered from swelling of the left knee during an illness a year previously. There were two preliminary attacks of extremely transient paraplegia. In this case also there was an absence of any cardiac affection to confirm the nature of the arthritis.

In a case of Alex. Reynault's, the visceral lesions were conspicuous, and rendered the diagnosis of rheumatism practically

certain. The patient was a man aged twenty-four, who had passed through many attacks of rheumatic fever. His illness commenced with paraplegic symptoms, loss of power in the legs, and paralysis of the sphincters; and on his admission to hospital the case was regarded as one of diffuse myelitis. Two days later there was already some recovery of power in the legs and swelling of several joints, and after a further interval of two days signs of endocarditis and pericarditis were developed. Then followed pneumonia and pleurisy, commencing on the left side and extending to the right.

A very remarkable example has been recorded by Vallin, in which pericarditis supervened. The patient, a man aged forty-three, who had suffered from rheumatic fever with cardiac lesions eleven years previously, was attacked almost suddenly with complete paraplegia. A week later the paraplegia was replaced by right hemiplegia, and the joints of the right hand became swollen. Then power was lost in the left arm, and the right recovered. A few days later the paralytic symptoms had entirely disappeared, but many joints became affected, pericarditis supervened, and the patient died. At the autopsy commencing pericardial adhesions were found. Other cases of a somewhat similar character might be quoted, but what has been said is sufficient to show that the subject of spinal rheumatism still requires a large amount of careful investigation before it can be regarded as placed upon a satisfactory footing. Senator suggests another possible source of error, namely, the mistaking of a series of pyæmic events for acute rheumatism; and it is also important to avoid being led astray by the development of paralytic chorea or of hysterical paraplegia, in the course of an attack of rheumatic fever.

Possibly in some instances the spinal affection is secondary to an affection of the articulations. Thus Engesser records the case of a man aged fifty-seven, whose illness commenced with tonsillitis followed by arthritis. A few days after the end of the attack he had a relapse, with intense pain in the sacro-iliac region, which yielded to salicylates; then intense pain along the sciatic and anterior crural nerves, which did not so yield, and which he attributed to a secondary meningeal affection; lastly, paralysis and atrophy of the leg-muscles and loss of knee-jerks, without loss of sensation, which he ascribed to anterior polio-myelitis. Engesser was inclined to attribute the whole series of events to extension from rheumatic arthritis of the sacro-iliac synchondroses and the joints of the lumbar spine.

The patient recovered in the course of a few months.

CHAPTER XIII.

RHEUMATIC AFFECTIONS OF THE NERVOUS SYSTEM.

PART II.—*Rheumatic Chorea.*

Early records of the association of chorea with rheumatism—The embolic theory—Objections—Bright's theory—Chorea often a manifestation of rheumatism—Dr. Maclagan's views—Heredity—The articular pains of choreic patients probably rheumatic—Extent of the association of chorea with articular rheumatism—Chorea and nodules—Pericarditis—Rheumatic nature of the endocarditis which attends chorea—Cardiac irregularity—Murmurs—Their frequency—Statistics—Lewis's results—Similarity of the curves of prevalence of rheumatism and chorea—Geographical distribution—Fright as an exciting cause of chorea.

THERE is a passage in the writings of Stoll which suggests that he was not unaware of the occasional association of chorea with rheumatism, and cases illustrating this association were recorded by Copeland and Pritchard in the early years of the present century. Scudamore in his work on "Rheumatism," which was published in 1827, speaks of chorea as an occasional sequela of rheumatic fever, and ascribes its occurrence to the debilitating effect of the acute disease. As early as 1802, Bright was in the habit of alluding to the relationship of chorea and rheumatism in his lectures, and in 1839 he advanced the theory that the nervous symptoms are of reflex origin, and depend upon the conveyance of a peripheral irritation from an inflamed pericardium. Babington, on the other hand, looked upon chorea as one of the metastases of rheumatism. In 1847 Begbie showed that not only does chorea arise in the course of a rheumatic attack, but also that it is apt to occur, apart from articular symptoms, in the members of rheumatic families, one child of a rheumatic parent suffering from simple articular rheumatism, another from rheumatism and chorea, and another from chorea alone. Three years later Germain Sée expressed his conviction

that chorea, and especially severe chorea, is in most instances a manifestation of the rheumatic diathesis; and Botrel went yet a step further, and asserted that all chorea is of rheumatic origin. Since then the question has been approached from many sides and by numerous observers, who differ widely among themselves in the views which they hold both as to the extent and nature of the association of articular rheumatism with chorea.

In the year 1863 Kirkes propounded the theory, which was received with much favour, that the symptoms of chorea are produced by the lodgment of showers of minute emboli in the small arteries of the nerve-centres, which emboli are supposed to have their origin in the inflammation of the cardiac valves. This embolic theory supplies a very simple explanation of the association of chorea with rheumatism; for by it the nervous symptoms are regarded as merely secondary phenomena, the sequelæ of rheumatic endocarditis. It is, however, open to several serious objections. The chief of these is that in those cases of chorea in which endocarditis is present, the signs of that condition are not infrequently developed later than the choreic symptoms, the two processes apparently advancing *pari passu*. Nor is endocarditis invariably present even in severe cases, as is shown both by the fallible evidence of auscultation, and by the indisputable results of *post-mortem* examinations. There is no *post-mortem* evidence clearly establishing the occurrence of embolisms in the nerve-centres in these cases, nor are the evidences of embolism elsewhere to be made out. The theory of Bright, who ascribed the chorea to irritation of the nerve-endings in the pericardium, is even less satisfactory, being negatived by the fact that in only a few of the cases in which chorea is associated with articular rheumatism is pericarditis present, and in chorea without arthritis the pericardium rarely suffers. As Dr. Dickinson clearly points out, it is endocarditis, and not pericarditis, which is especially met with in this association; and this observer believes that there is a pathological relationship between endocarditis and chorea with which rheumatism has nothing to do. This same idea has been expressed by others, who, although they cannot look upon the chorea as secondary to endocarditis, nevertheless consider that the two own a common cause which is not rheumatism. Many now hold that chorea is simply one of the primary manifestations of the rheumatic state, and that the endocarditis which accompanies it is rheumatic endocarditis. The acceptance of this view in no way requires that chorea should be in all cases ascribed to a rheumatic origin, for, as

we have seen, almost all the manifestations of rheumatism are produced by other causes also. It is not, however, scientific to group the cases into rheumatic and fright choreas, for whereas one of these is a predisposing, the other is an exciting cause, and they are therefore not comparable. It can, indeed, be shown that fright is an important exciting cause of rheumatic chorea, being merely one of those external influences which have so important an influence in modifying the characters of the rheumatic attack.

Dr. Gowers has clearly pointed out that the blood-change must not be regarded as the exclusive, or even as the dominant, element in the causation of chorea, and that two other factors must be taken into account, namely, "the influence of functional development as a predisposition, and of functional disturbance as an excitant of the disease." I would maintain that the blood-change, of which Dr. Gowers here speaks, is, in the majority of cases, due to the presence of the rheumatic poison, which only manifests itself in the form of chorea in those who have acquired or have inherited a certain favourable condition of the nervous system, and in them, as a rule, only after some emotional disturbance. Even if it be granted that chorea is, in the majority of instances, a manifestation of rheumatism, we have advanced but a single step in our knowledge of its pathology; for the manner in which rheumatism causes chorea is still entirely unknown. Dr. Maclagan has suggested that as rheumatism is essentially a disease of the motor apparatus, so chorea is essentially a disease of the motor centres, and that those who are subject to rheumatism are also, *cæteris paribus*, more likely to have susceptible nerve-centres than others who are not so subject. But to this view is opposed the fact that chorea has no similar association with other diseases which especially affect the motor apparatus, and that it is more intimately connected with endocarditis than with arthritis. On the other hand, as Dr. Maclagan points out, chorea is especially an affection of early life, and most articular diseases, other than rheumatism, are rare in childhood.

In speaking of the classification of the rheumatic lesions, I stated an hypothesis as to the nature of rheumatic chorea which I may briefly recapitulate here.

The intimate association of chorea with endocarditis suggests that it is possibly merely the outward symptom of some lesion of the nerve-centres, which is one of the fibrous group of rheumatic lesions; some temporary overgrowth of their fibrous structures. The possibility that this is the case has been sug-

gested by Dr. Cheadle in his Harveian Lectures of 1888. In support of this hypothesis may be urged the similar association of subcutaneous fibrous nodules with endocarditis, the afebrile character of the choreic attack, and the occurrence of chorea at that period of life at which the fibrous lesions are especially common. At least, it offers an explanation of the so frequent association of chorea with endocarditis, and of the development of this lesion during the attack; as well as of the temporary character of the nervous symptoms. I believe that much of the difference of opinion which exists as to the relation of chorea to rheumatism is more apparent than real, depending upon differences in the meaning attached to the latter term. Whereas one person who speaks of this relationship refers only to the occasional occurrence of chorea after or concurrently with arthritis; another, using the word rheumatism in a wider sense, implies the dependence of chorea, not upon rheumatic arthritis, but upon the morbid process of which arthritis is only one of many manifestations.

When speaking of the influence of heredity, I mentioned the fact that the tendency to chorea is far more conspicuous in some rheumatic families than in others, and pointed out that this is probably due to some peculiarity of the nervous organisation of their members. Among choreic patients, a large number are members of rheumatic families, whereas a family history of chorea without rheumatism is decidedly uncommon; and we are justified in concluding that in those families in which some members suffer from chorea with, and others without, articular rheumatism, the chorea is in each case of rheumatic origin. If this be granted, it is obvious that the category of rheumatic chorea must be enlarged, so as to include many cases in which there is no associated articular rheumatism, and no history of joint-pains. This is not difficult to concede when we remember that children, who are the chief subjects of chorea, are also very liable to the various forms of abarticular rheumatism.

If chorea with endocarditis may constitute the whole of a rheumatic attack, it must also be granted that in some instances chorea may be the sole manifestation of rheumatism, and that cases of rheumatic chorea probably occur in which even endocarditis is absent. Obviously, then, it is well nigh impossible to arrive at any accurate estimate of the part played by rheumatism in the causation of this symptom, and the published statistics, being based almost entirely upon the history of arthritis, must give but a very imperfect notion of its influence.

The influence of rheumatic heredity has been but little studied by those who have written on the subject. Dr. Angel Money obtained rheumatic family histories in 28 out of 214 cases; Dr. Syers in 41 out of 122 cases; Dr. Herringham obtained family histories of rheumatic fever in 25 out of a series of 75 cases; and in a series of 80 cases which I collected, there were 25 with family histories of rheumatic fever, and 6 with histories of rheumatism simply. In each of the above-mentioned series the inquiries were limited to the nearest relations of the patients.

When the personal histories of the patients are considered, it is important to form a definite idea as to what is to be accepted as evidence of articular rheumatism. Articular pains, unattended by swelling, are common in choreic children, and if such pains are admitted, it is obvious that a far larger proportion will be obtained than will be the case if more definite evidence is demanded. There is good reason for believing that such articular pains are truly rheumatic, for they are met with in patients who have suffered from previous attacks of chorea in association with rheumatic fever, and, apart altogether from chorea, such pains form a very prominent feature in the rheumatism of childhood. There are, however, pains of other kinds which must be excluded, such as those which affect an entire limb, or which result from self-inflicted injuries due to the incoördinate movements.

The following table embodies the statistics of several different observers:—

Name of Observer.	Total Number of Cases of Chorea.	Number with Personal History of Rheumatic Fever.	With Personal History of Rheumatism.	Doubtful Cases.
Angel Money	214	33	23	9
Hughes	100	...	8	...
Syers	122	31	...	...
Stephen Mackenzie	172	47	28	23
Herringham	80	21	...	16
Sturges	121	7	15	...
Pye Smith	150	...	45	...
Sée	128	...	61[1]	...
A. E. Garrod	80	15	10	9

The statistics are all based upon the history of articular symptoms, because these are the only ones of which the patients or their parents can give any account, but in particular cases collateral evidence of other kinds may often be obtained. In some cases in which chorea is the earliest event in the rheumatic

[1] Articular pain or inflammation.

series, the true nature of the case is only demonstrated by the subsequent development of arthritis or erythema, or some other manifestation of rheumatism. There are, moreover, certain interesting cases, to which allusion has already been made, in which a crop of subcutaneous nodules is developed in the course of an attack of chorea with endocarditis, in which the joints are not at all affected. Again, pericarditis may be developed in association with chorea, and even those who question the rheumatic nature of choreic endocarditis will admit that pericarditis, when it so occurs, is in all probability rheumatic.

Although endocarditis is at least as distinctly rheumatic as arthritis, there are many who, while they are ready to ascribe a rheumatic origin to chorea with joint-lesions, refer the endocarditis when it is not associated with arthritis to a different cause. It is not easy to understand why this is the case. We have seen that there is good reason for believing that endocarditis, when it occurs alone in children, is a rheumatic manifestation, and the association therewith of a symptom which all admit to have some connection with rheumatism seems to me only to strengthen the argument. Nevertheless it must be acknowledged that physicians whose opinions are entitled to the greatest respect have held, and still hold, that the endocarditis of chorea is either due to the chorea itself, or is a result of the mental shock which so often precedes its onset, or that both the chorea and the endocarditis are manifestations of some morbid process allied to, but not identical with, rheumatism. One of the arguments urged in support of such views is, that only in comparatively few cases does chorea directly follow acute articular rheumatism; but if this objection be accepted as valid, it is fatal to all that has been said as to the characters of rheumatism in childhood.

In many cases the endocarditis associated with chorea is unquestionably rheumatic, for the proportion of murmurs is highest amongst those who suffer, or have suffered, from articular rheumatism. As I have already said, murmurs may be developed by choreic patients under observation. I have myself seen a considerable number of cases in which this was the case, and in a paper on "Chorea as a Cause rather than a Result of Endocarditis," Dr. Herringham has brought forward some valuable evidence upon this point, giving the notes of two cases which he has had under observation for several years. Dr. Herringham further shows that evidences of endocarditis in the shape of small beads and granulations are sometimes present upon the cardiac

valves in certain other convulsive disorders, namely, tetanus and hydrophobia, and suggests that such slight changes as were observed in the cases which he quotes, might well be overlooked, unless special search were made for them. It is evident that these observations have very important bearings upon the question of the nature of the endocarditis of chorea; and if further observations should show that such changes are at all frequently present in other convulsive diseases, the fact will weigh heavily in the scale against the theory which regards this form of endocarditis as of rheumatic origin.

In chorea, as in articular rheumatism, the commonest murmur is a systolic blow, best heard at the apex, but audible in the axilla and below the angle of the left scapula. These murmurs are often very faint, and are frequently heard when the patient is lying down for some time before they are audible in the erect position, and it has been demonstrated that lesions which are well marked *post-mortem* may be insufficient to produce any murmur during life. The absence of a murmur is, therefore, no certain evidence of the integrity of the endocardium. The proportion of cases in which murmurs are heard is a very large one, and if the endocarditis and the chorea are both of rheumatic origin, it must be concluded that there exists a very close association between these two manifestations, even when allowance is made for the fact that both are especially common in childhood. This association recalls that which exists between erythema and arthritis, and endocarditis and subcutaneous nodules. Dr. Pye Smith found that of 139 cases in which the condition of the heart was recorded, there were 80 in which no bruit was heard, 43 with systolic apical, and 9 with systolic basal murmurs. When those cases were excluded in which there was a personal history of articular rheumatism, 105 cases remained, in 20 of which murmurs were heard, and 2 in which their presence was doubtful. Dr. Angel Money found evidence of definite cardiac lesions in 31 out of 214 cases, the mitral valve being affected in 29, the aortic valves being incompetent in 2. In 7 cases the heart-affection preceded the chorea, in 1 it followed the attack, and in 23 the sequence was doubtful. Dr. Dickinson states that among 70 cases of chorea which he observed, there were only 14 in which the heart-sounds were natural; in 11 the action was irregular; in 3 there was reduplication or alteration of the sounds, and in 42 valvular murmurs were heard. Of 28 cases in which chorea succeeded articular rheumatism there were valvular murmurs in 22; and of 20 ascribed to mental causes, with

no rheumatic history, 11 had valvular murmurs. Dr. Syers found that amongst 122 cases of chorea, there were 18 in which constant systolic murmurs were present, and of these patients 9 had suffered from rheumatic fever. In 54 other cases there were apical murmurs, which disappeared before the patients left the hospital.

Dr. Stephen Mackenzie, whose statistics are most elaborate and valuable, showed that amongst 47 cases in which there was a clear history of articular rheumatism, there were murmurs in 34, or 72.34 per cent; among 28 cases, probably rheumatic, there were murmurs in 12, or 42.85 per cent.; of 23 cases the rheumatic origin of which was very doubtful, there were 12, or 52.17 per cent. with murmurs; whereas of 66 cases with no history of articular rheumatism at all, there were 31, or 46.96 per cent. with murmurs. Dr. Herringham found the heart-sounds natural in 10 of his 80 cases; there were uncertain evidences of endocarditis in 25, and definite valvular murmurs in 20; in 11 cases murmurs developed under observation, and murmurs at first present disappeared in four. Murmurs were heard in 45 of my 80 cases, or 56.25 per cent., and in six others the sounds were murmurish. In nine cases systolic murmurs, best heard at the apex, developed under observation.

In some cases of chorea the murmurs have an intermittent character, and irregularity and dilatation of the heart are often observed.

The view that chorea is, in most instances, a manifestation of rheumatism has received fresh support from the observations of Dr. Lewis of Philadelphia, which have been already referred to, which have brought to light a remarkable relationship between the prevalence of chorea and of rheumatism in that city. It will be remembered that Lewis found that there was a remarkable likeness between the annual curves of the two affections, which exhibited similar elevations and depressions, but that the variations of the rheumatism curve followed just a month later than those of the curve of chorea. It is evident that the importance of the correspondence of the two curves is in no way dependent upon the value of Dr. Lewis's further observations as to the influence of storm-centres upon both. A Committee was appointed by the British Medical Association to study the geographical distribution of certain diseases in this country by means of a collective investigation. In the report of this Committee, which was drawn up by Dr. Isambard Owen, it is stated that in only about a hundred of the localities whence returns were obtained was rheu-

matic fever reported to be uncommon, and it is a curious fact that amongst these places there were only four in which chorea was stated to be prevalent. Now, many of these places were villages and small country towns, in which chorea tends to be less common than in cities; but the prevalence of chorea in them was much less than might have been expected from a general study of the chorea map, and the coincidence was as well marked in the larger as in the smaller towns.

That emotional and mental disturbances have a large share in the immediate causation of chorea is beyond question, and in many cases such provoking causes are the only ones which can be made out. It must be remembered, in considering these cases, that the subjects of chorea are usually in a highly sensitive, nervous condition, which renders them more susceptible to fright than ordinary individuals, and careful inquiry will sometimes elicit the fact that slight choreic movements were noticed some hours, or even days, prior to the fright to which the origin of the chorea is attributed. There is much resemblance between the emotional state which accompanies chorea and the nervous condition so frequently observed in rheumatic children, and, as I have already said, I believe that such children often exhibit degrees of chorea so slight as to escape observation, unless carefully looked for. In conclusion, I would express my belief that chorea is, in the majority of instances, a manifestation of the rheumatic state, but that there are also many attacks which arise entirely independently of rheumatism, and that in such cases the exciting cause, be it a fright or be it over-pressure at school—an influence the importance of which Dr. Sturges has so well pointed out—is, as a rule, conspicuous, whereas the predisposing causes are obscure. I believe also that when endocarditis accompanies chorea, such endocarditis is of rheumatic origin, and that its presence affords sufficient evidence that the whole attack is actually of such a nature.

CHAPTER XIV.

RHEUMATIC AFFECTIONS OF THE NERVOUS SYSTEM.

PART III.—*Peripheral Neuritis, &c.*

Multiple neuritis an occasional sequela of rheumatic fever—Local neuritis more common, especially neuritis of ulnar nerve—Sometimes due to extension of inflammation—Dr. Judson Bury's observations—Observations of Drs. Hadden and Reynault—Neuralgia—Possible remote connection of exophthalmic goitre with rheumatism.

Peripheral Neuritis.—It is probable that not only the great nerve-centres, but also the peripheral nerves are occasionally the seats of rheumatic affections. Multiple neuritis is sometimes observed as a sequela of rheumatic fever, and when slight, may perhaps be overlooked, the symptoms being attributed to the debilitating effect of the acute attacks. I am indebted to Dr. Hale White for the notes of a case which was under his care, which he regarded as an example of this affection. The patient was a man aged fifty-seven, who had suffered from no less than three attacks of rheumatic fever, the last of which was six months before he came under Dr. White's care. For two months after this attack he had suffered from numbness of the fingers, which gradually passed off, but was succeeded by pains in the feet after walking and when he was warm in bed. The patient complained of weakness of the legs, and both the patellar and cremasteric reflexes were absent. A careful examination failed to reveal anything else abnormal.

Freud has observed multiple neuritis of both spinal and cerebral nerves in association with arthritis, endocarditis, and profuse sweating, and cases of similar nature have been described by Remak and others. In an extremely interesting case recorded by Foxwell, paralytic symptoms and a loss of sensibility to differ-

ences of temperature were observed as sequelæ of an attack of acute rheumatism, in the course of which the temperature rose to no less than 111°, and the patient's life was saved by bathing. In some of the recorded instances the nature of the nervous sequelæ was very obscure, and it is doubtful whether the symptoms were due to a neuritis or to lesions of the nerve-centres.

More common than these cases are others in which there is a local neuritis, occurring as a sequela of acute rheumatism, and leading to atrophy of groups of muscles supplied by some particular nerve, usually the ulnar; to the production of areas of anæsthesia corresponding to the distribution of certain cutaneous nerves, or to glossiness of the skin and dystrophies of the hair and nails. In considering such cases, it must be borne in mind that any form of arthritis may be attended by atrophy of the muscles which move the affected joint, which atrophy is usually accompanied by an increase of myotatic irritability; although, in consequence of the transitory nature of acute rheumatic arthritis, such atrophy is usually little marked in rheumatic fever. When, however, rheumatoid changes supervene in the damaged joints, they are attended by the secondary phenomena which form such conspicuous features of rheumatoid arthritis. Again, the inflammatory process in a joint may extend to the nerve-trunks in its immediate neighbourhood, and in this way a local neuritis may be produced, which is secondary in its nature, and not due to a specific rheumatic inflammation of the nerves. To such neuritis by extension the ulnar nerve is much exposed, and this may perhaps partly explain the comparative frequency with which it is attacked. It is therefore important, in any given case, to observe the condition of the joints of the affected limb, and to ascertain, as far as possible, whether they were implicated during the acute attack.

Dr. Judson Bury, who has devoted special attention to the association of peripheral neuritis with rheumatism, has brought forward a series of most interesting examples in which such lesions follow both articular rheumatism and chorea; and of two of these I may quote the leading points. A young woman aged twenty-three, whose sister had had rheumatic fever, and had cardiac disease, was admitted to hospital suffering from an attack of rheumatic fever, in the course of which she developed endocarditis and a crop of subcutaneous nodules. There was tenderness and swelling over the positions of the ulnar nerves, atrophy and paresis of the interossei of the hands, probably similar atrophy of the interossei of the left foot, and temporary anæs-

thesia in the area supplied by the right internal saphenous nerve. In this case both the knee and the elbow joints were the seats of arthritis, and it might be supposed that the arthritis was due to extension; but in other cases which Dr. Bury quotes there is no evidence that this was the case. Another case was that of a lady who suffered from rheumatic fever with pericarditis and left pleurisy. She soon exhibited partial anæsthesia in the area of the ulnar and internal cutaneous nerves of one arm, which lasted three or four days. The interossei and thumb muscles were wasted, and the terminal phalanges of the fingers were slightly hyper-extended. By the kindness of Dr. Barlow I am able to reproduce drawings of the hands of a rheumatic girl aged eight, who exhibited well-marked atrophy of the interossei and thumb muscles, after a third attack of rheumatism in which chorea and nodule formation were the most conspicuous manifestations. (Figs. 2 and 3.)

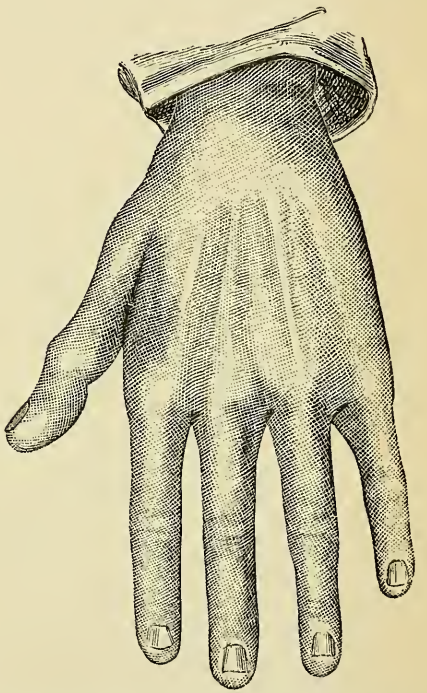


Fig. 2.—Hand of a Child aged eight, under the care of Dr. T. Barlow, showing wasting of the Interossei in connection with a Rheumatic Attack.

Dr. Hadden has also recorded cases in which trophic changes followed articular troubles. One of his patients was a woman aged thirty-one, who had suffered from rheumatic fever one year, and from rheumatic pains in the knees, back, and hands one month before she came under observation. All the fingers of the right hand were in the position of extension; the index and middle fingers were wasted, sensation was impaired, and the fingers could not be separated so well as those of the left hand. The atrophy was especially well marked in the terminal phalanges, which were glossy, and the nails were long and filbert-shaped. There was also some atrophy of the muscles of the right upper arm. M. Alex. Reynault has described a remarkable case, in

which there was loss of hair and nails after each of a series of rheumatic attacks. The patient was a man thirty-four years of age, whose father had suffered in the same peculiar manner, and whose brother and sister were also rheumatic. I have myself met with local atrophies and anæsthesia apparently dating from rheumatic attacks, but in most of the cases in which the muscular atrophies have been considerable, there have been secondary rheumatoid changes in the joints. However, this was by no means always the case. One such patient was a woman aged thirty-six, a member of a rheumatic family, who had herself suffered from rheumatic fever at the age of eleven, and again at twenty-

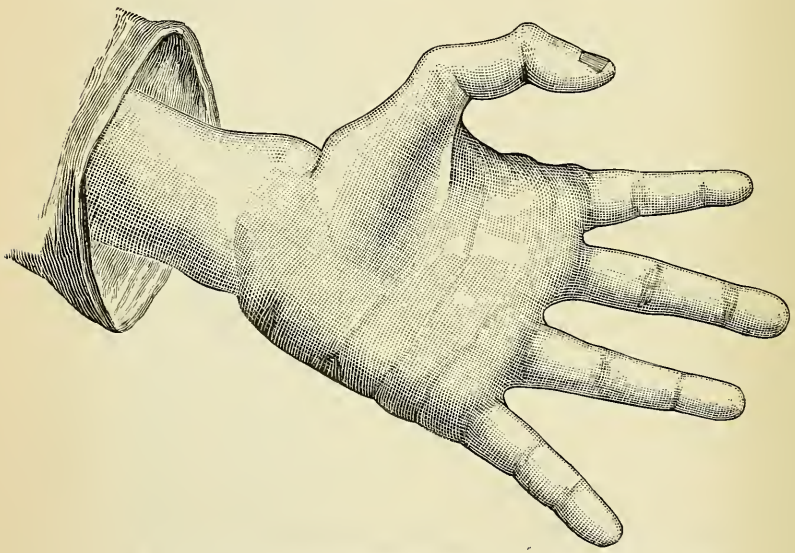


Fig. 3.—Hand of the same Patient, showing Atrophy of the Thenar Muscles.

nine, and had had a third slight attack two months before I saw her. She had been subject to articular pains for several years, and for two or three years had suffered from cramp, and tingling and "hot pains" at times, especially in the left arm. The measurements of the two arms were equal. The thenar and hypothenar eminences were somewhat flattened, and the interosseous grooves were conspicuous. The patient was unable to separate the fingers of the left hand, and the little and ring fingers of both hands, especially those of the left, were flexed, but the deformities could be easily reduced. There was no enlargement of any joint. Areas of anæsthesia were found upon the palmar surfaces of the right thumb and forefinger, and of

the left ring and little fingers. Electro-sensibility was much impaired in the left hand. The contractility to both currents was diminished in the interossei, and in the muscles of the left thumb and little finger. KCC. was everywhere greater than ACC. The supinator and triceps reflexes were increased in both arms.

Neuralgia.—Many physicians, among whom are Immermann and Edlefsen, assign to rheumatism a very important part in the causation of various neuralgic affections, but here again the same difficulties are encountered which surround the question of muscular rheumatism. Dr. Gowers writes: "The connection with rheumatism (of neuralgia) is often conspicuous, and is seen in several aspects. Persons who are liable to rheumatism of the fibrous tissues sometimes suffer from pains which have both rheumatic and neuralgic characters, not specially related to the nerves in situation, and yet paroxysmal and unconnected with movement." In connection with acute articular rheumatism severe neuralgias are not often met with. I have observed in one case intense neuralgia of the genital-crural nerve associated with subacute rheumatic arthritis of the corresponding knee, but in this instance the neuralgia was markedly periodic, and the patient had previously suffered from ague. Brieger has recorded some instances in which sciatica appeared in the course of typical attacks of rheumatic fever.

Exophthalmic Goitre.—This is perhaps the best place in which to speak of the possible remote connection of exophthalmic goitre with rheumatism. Dr. Samuel West first drew attention to the frequency with which rheumatic histories are obtained in cases of this disease. In no less than eight out of a series of thirty-eight cases which he collected there was a personal history of rheumatic fever, and in two others of pain and swelling of joints. He is inclined to attribute some of the murmurs observed in association with exophthalmic goitre to previous rheumatic attacks. Since reading Dr. West's paper, I have collected a series of ten cases of exophthalmic goitre, in three of which there was a family history of rheumatic fever in near relations. One other patient had suffered from rheumatic fever, and one patient, who had a rheumatic family history, had a systolic apical murmur which was heard in the axilla. Four patients had systolic murmurs, best heard at the left base, such as are commonly met with in Graves' disease. A far larger series of cases is of course necessary for the confirmation of Dr. West's views.

CHAPTER XV.

THE CUTANEOUS MANIFESTATIONS OF RHEUMATISM.

Secondary eruptions—Sudamina and miliaria—The erythemata—Erythema multiforme, papulatum, and marginatum—Bullous erythema—Erythema nodosum—Urticaria—Rheumatic œdema—Scarlatiniform rash—Desquamation—Purpura rheumatica—Hæmorrhages in erythema multiforme and nodosum—Purpuric erythema—Purpura with ulcerative endocarditis—Non-rheumatic purpura with articular lesions — Erysipelas not a rheumatic skin affection — Psoriasis — Scleroderma, the evidence of a relation of this lesion to rheumatism insufficient.

In the course of an attack of rheumatic fever, as in any other disease in which sweating is a conspicuous symptom, sudamina and miliaria rubra may be developed. The former are very commonly observed, the latter in a small proportion of cases, about 3.8 per cent. according to Lange. These purely secondary eruptions are of very inferior interest to others, which are so frequently and so intimately associated with the rheumatic state, that they cannot but be regarded as actual primary manifestations of the disease. Of these, the most important are the various erythematous rashes classed together under the name of erythema multiforme; but erythema nodosum, urticaria, and a species of purpuric erythema must also be included in the same category.

Just as chorea may attack a rheumatic patient as the consequence of fright or some other emotional disturbance, so an erythema which forms one of a series of rheumatic phenomena may have its apparent origin in a gastric disturbance, or in the administration of some particular drug. One of the most typical cases of rheumatic erythema which I ever saw was that of a girl who had grave cardiac disease which dated from an attack of rheumatic fever, and who developed a number of rheumatic lesions in rapid succession; she came to the hospital complaining of

epigastric pain, and with an eruption of erythema papulatum. In another instance an erythema, which developed during convalescence from a rheumatic attack, and which constantly recurred under all treatments, was always aggravated when the patient took quinine. Indeed, it has been suggested that these erythemata are simply quinine rashes, which owe their apparent association with rheumatism to the extensive employment of the drug in the treatment of that disease; but such a view is absolutely negatived by the fact that the erythematous eruption is often present in rheumatic cases before the patient comes under treatment at all.

Some have maintained that the slighter forms of arthritis which so frequently accompany the erythemata are not rheumatic at all, and that the erythemata are the rashes of specific febrile diseases, of which the articular lesions are also symptomatic. In a contribution to the 24th volume of the St. Bartholomew's Hospital Reports, I endeavoured to show that the arthritis which accompanies the erythemata may have any degree of severity, from the acute lesions of rheumatic fever to the most trifling articular pains, and that, therefore, no distinction can be drawn between the slight and severe cases. Moreover, it has been shown that sometimes, although rarely, both endocarditis and pericarditis may occur in cases in which there are merely articular pains, without any objective signs of inflammation.

Erythema Multiforme.—In his work on diseases of the skin, published in 1835, Rayer was the first to call attention to the association of erythema with articular rheumatism. Since that date many cases illustrating this association have been placed on record, and the question has been discussed in valuable monographs by Coulaud, Begbie, Stephen Mackenzie, and others. The varieties most frequently met with in intimate association with articular and abarticular rheumatism are those known as erythema papulatum and erythema marginatum or circinatum. Both these varieties may appear simultaneously in the same patient, or the one may pass into the other.

The eruption of erythema papulatum consists of spots varying in size from a pin's head to that of a sixpenny piece, of irregularly rounded outline, and slightly raised above the surrounding skin. The colour of the spots is peculiar, and is best described as a bluish pink, and into them slight hæmorrhage often takes place, so that in fading they leave behind them a faint mark resembling a bruise. The eruption usually appears in successive crops, fresh spots developing whilst others are fading away.

Erythema papulatum may appear upon any part of the body, but is generally most marked upon the limbs, and especially upon the dorsal surfaces of the wrists, hands, and feet. Dr. Liveing states that the eruption is never unilateral, and tends to be distributed with remarkable symmetry.

Erythema marginatum, when well developed, is one of the most remarkable of cutaneous affections. The eruption consists of circles of various size, which may attain to a diameter of several inches. Each circle is enclosed by a slightly raised pink ring, whilst the central area has a livid hue. After the eruption has been out for a time the rings are apt to coalesce; with the result that a large livid area is formed, which is bounded by the remaining segments of the component rings. In this form of erythema also, hæmorrhages are very general, and, as in the preceding variety, a discoloured patch remains after the spots have disappeared. A burning or tingling sensation is usually experienced in the affected areas.

In some rare instances rheumatic erythema assumes a bullous form, as in a case which was described in the chapter on rheumatism in children (p. 76). A far more remarkable case of this kind has been recorded by Dr. Benham.

It is not easy to form any accurate estimate either of the proportion of cases of erythema multiforme which are of rheumatic origin, or of the proportion of rheumatic cases in which an erythematous rash is developed. M. Camille Coulaud found that among twenty-one cases of erythema multiforme taken without any selection, there was a history of rheumatic fever in twelve; and of less severe, but no less characteristic, rheumatic attacks in the remaining nine. It is probable that this proportion is excessive, for many of the cases were published ones, and such cases are usually placed on record because they illustrate this association. Yet the association is, beyond question, a very intimate one, as is shown by the following analysis of twenty consecutive cases of erythema multiforme which I recently tabulated:—

In 5 cases there was neither family nor personal history of acute rheumatism; the heart was natural, and there were no articular pains.
6 patients suffered from articular pains with the erythema, and of these
2 gave family histories of rheumatic fever.
1 had suffered from rheumatic fever, and had cardiac disease.
3 had neither family nor personal histories of rheumatism.
1 patient had subacute arthritis, came of a rheumatic family, and had herself had rheumatic fever (heart natural).
1 was convalescent from rheumatic fever, and had cardiac disease.

1 had rheumatic fever (third attack), and aortic disease, and developed pericarditis in the hospital.
1 had articular pains, pericarditis, tonsillitis, and subcutaneous nodules, had had rheumatic fever, and had grave mitral disease.
1 had arthritis, mitral disease, tonsillitis, nodules, and chorea.
1 had chorea, arthritis, nodules, and mitral disease.
1 had subacute arthritis only.
2 had subacute arthritis and developed endocardial murmurs.

It will be seen that no less than nine (nearly one-half) of the patients were suffering or had suffered from definite rheumatic attacks, and, if the presence of articular pains is admitted as evidence, the proportion is raised to three-quarters.

Among the twenty-seven children with subcutaneous nodules included in the paper of Drs. Barlow and Warner, no less than seven developed erythema multiforme ; and Dr. Cheadle states that of eight severe cases of rheumatism in children which came under his care in a single year, cutaneous erythema was observed in no less than four. In many individual cases the manner in which the erythema appears in direct association with other rheumatic lesions leaves no doubt in the mind that it is as truly a rheumatic manifestation as arthritis itself.

Erythema Nodosum.—This form of erythema is far less commonly met with in the course of attacks of rheumatic fever than are the papulate and marginate varieties, and consequently its rheumatic origin is less obvious, and the proof thereof is more difficult.

That an intimate association of this eruption with rheumatism does nevertheless exist was shown by Dr. Begbie in a paper published as early as 1850, and Dr. Stephen Mackenzie has brought forward a mass of valuable evidence bearing upon this point, derived from the examination of the records of 108 cases.

Dr. Mackenzie's results may be briefly summed up as follows :—

In 13 of the 108 cases the erythema was associated with acute articular rheumatism.
In 14 with the subacute variety.
In 17 others with articular pains.
In 7 cases a cardiac lesion developed during an attack of erythema nodosum with arthritis or joint-pains, in patients who had suffered from no previous rheumatic attack.
In 13 others cardiac lesions of older date were present.
In 2 instances murmurs were developed during attacks of erythema nodosum in which the joints escaped entirely, but it is not mentioned whether these murmurs were heard in the axilla or behind.

It will be interesting to compare with the statistics of erythema multiforme the analysis of twenty consecutive cases of erythema nodosum of which I have notes.

Of the twenty patients :—

3 had neither family nor personal histories of articular rheumatism, and their hearts were natural.
6 gave family histories of rheumatic fever.
3 gave both family and personal histories of articular rheumatism.
1 had passed through two attacks of rheumatic fever.
2 had articular pains only.
4 had pain and swelling of joints.
1 had subacute arthritis and chorea.

The evidence afforded by this table is certainly less cogent than was contained in the table for erythema multiforme, but in no less than eleven cases there were histories of articular rheumatism or joint-pains, and among the remainder the large proportion of rheumatic family histories is noteworthy. Whereas among the cases of erythema multiforme there were no less than seven with definite cardiac lesions; such lesions were present in only one case of erythema nodosum, whilst in three others the heart sounds were not natural. This difference is only what might be anticipated from the comparative rarity of erythema nodosum as an accident of acute rheumatic attacks, and serves to emphasise the fact that endocarditis and pericarditis are rare in cases in which erythema is the most conspicuous feature, to which class the cases of erythema nodosum for the most part belong. But that they may occur even when the joints escape entirely is shown by a case described in the chapter on rheumatism in childhood; and Dr. Cheadle relates the example of a boy aged two years and eight months, who was not known to have ever suffered from arthritis, and who had no articular pains, but who developed a mitral regurgitant murmur during an attack of erythema nodosum.

The eruption of this form of erythema consists of nodes, few or many in number, which are usually situated upon the legs below the knees, but are sometimes met with on the arms and in other situations. The nodes are considerably raised above the surrounding skin, and are very tender when touched. Their colour is at first pink, but it is soon altered by the extravasation of blood into the tissues. The duration of the eruption is somewhat longer than that of the other forms, as might be expected from the greater amount of swelling which is produced; and as the nodes disappear they leave behind them discoloured patches which

closely resemble ordinary bruises. Erythema nodosum is seldom met with in association with the varieties of erythema multiforme, but in young children the eruption sometimes assumes the nodose form upon the legs, and the papulate or marginate upon the trunk.

Urticaria.—While rheumatism has so large a share in the production of erythema multiforme, and plays a very important part in that of erythema nodosum, it is probably one of the less frequent causes of the allied affection, urticaria. Nevertheless, in certain cases urticaria appears to be a truly rheumatic manifestation. It occasionally occurs as one of a series of rheumatic events in childhood, and may be developed in the course of rheumatic fever; but the relationship is chiefly shown by its appearance in those who inherit the rheumatic tendency, or have themselves suffered at some previous time from the disease. This subject has received but little attention from writers upon rheumatism, but Besnier points out that urticaria may be the earliest symptom of an attack of rheumatic fever, and that its appearance after exposure, with some associated febrile disturbance, should suggest the possibility that it is a precursor of such an attack. In many text-books also, both of medicine and of diseases of the skin, rheumatism is mentioned as a factor in the ætiology of urticaria.

Rheumatic Œdema.—MM. Devaine, Kirmisson, and others have described a rheumatic œdema which is met with in cases in which the ordinary conditions which give rise to œdematous swelling are absent. In many of the cases which are described by these authors erythematous eruptions were observed, and it seems probable that the œdema which they describe is such as is not an uncommon concomitant of the erythemata and urticaria. I recently had under my care a young man who applied for treatment on account of an œdematous swelling of the dorsum of one of his hands, which extended to the forearm. On examining the arm, a serpiginous pink line was found at the upper margin of the œdematous area, and upon the other arm was a typical ring of erythema marginatum. In this case there was nothing to suggest that the erythema was of rheumatic origin, but similar swellings are met with in rheumatic subjects. The puffiness of the face which is so frequently associated with urticaria upon the trunk and limbs is familiar to all, and I have not infrequently observed a similar puffiness of the face in rheumatic children apart from any coincident urticaria or erythema; but such patients have usually suffered at some previous time from one

or other of these affections. I may quote the example of a boy who, having recently recovered from a rheumatic attack with slight arthritis and pericarditis, came to me with a swelling of the right side of his face, by which the right eye was almost closed. There was no sign of erythema or urticaria at the time, but the boy had suffered two years previously from a severe attack of urticaria. Another boy, who was said to have had several attacks of rheumatic fever, and whom I had previously seen during a slight attack of chorea, presented himself with considerable puffiness of the whole face and swelling of the eyelids; and although no erythema was apparent at the time, the history pointed strongly to the occurrence of patches of erythema before the swelling of the face was noticed. These cases and others of the same kind have convinced me that rheumatic subjects are liable to an affection which may be rightly described as rheumatic œdema, but that this affection is merely a form of erythema in some cases, of urticaria in others, and that it is not more exclusively rheumatic than other varieties of these eruptions.

Possibly the small and very transitory swellings observed by Féréol, chiefly upon the scalp, and described by him as *nodosités rhumatismales ephémères*, were of a similar nature.

Scarlatiniform Rash.—Some observers have described the development of a scarlatiniform rash in the course of rheumatic fever, but it is obvious that the diagnosis of such cases from scarlatinal rheumatism must necessarily be a matter of considerable difficulty. One of the most remarkable cases of this kind was recorded by Dr. Handfield Jones, whose patient was a woman aged twenty-eight, who was said to have already suffered from scarlatina. The scarlatiniform rash appeared during convalescence from rheumatic fever, and was accompanied by a sore throat. The patient became "as red as a boiled lobster," and subsequently desquamated. M. Derrecagaix collected in his graduation thesis seven examples, but these also are little convincing. Some of them were apparently examples of erythema papulatum and of miliaria rubra, whilst in others the rheumatic element was at least extremely doubtful. Indeed, the evidence that a scarlatiniform rash is to be included among the manifestations of rheumatism, is so inconclusive that it fails to carry conviction.

Desquamation.—Desquamation is occasionally observed in rheumatic cases in which there is no ground for supposing antecedent scarlatina. It is mentioned by Dr. Barlow as having occurred in

one of his original nodule cases, and Dr. Samuel West tells me that he also has observed it.

By the kindness of Sir Dyce Duckworth I am able to give short notes of a case from his wards in which I observed this phenomenon.

The patient was a girl aged fourteen, who was admitted with chorea, and with arthritis of the hands and knees. Her mother had had rheumatic fever, and an aunt chorea. She had always been a delicate and very nervous child. The joint-symptoms had been observed for four weeks before admission, and the chorea for three. There was a systolic murmur at the apex, which was conducted into the axilla, but the heart was not hypertrophied. Desquamation of the hands was noticed on admission, but there was no reason to suspect scarlatina. During her stay in the hospital the desquamation of the hands continued; she developed numerous subcutaneous nodules over the fibulæ, along the tendon of each palmaris longus (see fig. 4, p. 156) and on the head; and exhibited at one time a copious eruption of erythema papulatum.

Purpura Rheumatica.—Much obscurity surrounds the use of the term "purpura rheumatica." Schönlein originally gave the name of *peliosis rheumatica* to an eruption of small bright red spots, the size of a lentil, situated chiefly upon the legs below the knees, which gradually changed in colour to brown or yellow. He distinctly stated that these spots disappeared on pressure. Schönlein's description suggests that the affection which he described was some form of erythema, for these eruptions, although they disappear on pressure, leave behind them discoloured ecchymotic areas. Such hæmorrhage into an erythematous patch is indeed one of the several ways in which purpura may arise in association with rheumatism.

As I have already said, the lesions of erythema nodosum are almost invariably the seats of slight ecchymosis, and they may be accompanied with hæmorrhages so profuse as to prove fatal to the patient, as in a case recorded by Dr. Wickham Legg. Indeed, many authors, amongst whom are MM. Duriau and Legrand, have employed Schönlein's term as a synonym of erythema nodosum, and it is important to remember this when studying the literature of the subject. Somewhat extensive hæmorrhage may also occur into the spots of erythema papulatum or marginatum, and the eruption may disappear entirely from the upper parts of the body, leaving merely ecchymotic patches upon the legs, the origin of which may only be revealed by the development of a fresh eruption of erythema under obser-

vation. This is well illustrated by the following cases:—A woman aged thirty-nine, who had suffered from four attacks of rheumatic fever, and who had a loud systolic mitral murmur, came under my care with post-rheumatic rheumatoid arthritis. She presented herself one day with extensive cutaneous hæmorrhages on both legs, of a bright red colour, and having an annular arrangement, each ring having a bright red spot in its centre. In the parts of the skin which had been covered by the boots, the hæmorrhagic marks were considerably paler than those on the shins. The patient stated that two days previously a copious eruption, resembling ringworm in appearance, and having the colour of red cabbage, had appeared all over her trunk and legs, but this had entirely disappeared from all parts except the legs. Again, a young man aged twenty-eight, who had suffered from rheumatic fever eighteen months previously, and had a mitral systolic murmur, presented himself with pains in the joints, and with small hæmorrhagic spots below the knees. These spots were quite unlike those of ordinary purpura, being made up of fine branching lines. They appeared in successive crops for some months, and I had several opportunities of observing well-marked erythematous rings upon the arms, and the patient said that an eruption of such rings always preceded the appearance of the hæmorrhagic spots.

There is a form of rheumatic erythema which is hæmorrhagic from the first, and to this form I would limit the use of the term purpura rheumatica. The eruption consists of slightly raised spots, bright red in colour, varying much in size, and not disappearing on pressure; at a later stage the spots are apt to become more purple. The following cases were examples of this condition. A youth aged eighteen, who gave no rheumatic family history, but who had occasionally suffered from articular pains, developed a bad sore throat, followed, three weeks later, by pains in many joints, with swelling of the knees and of the dorsum of the left hand. Three or four days after the joints became affected, purpuric spots, varying in size from a pin's head to a shilling, appeared upon both legs. The spots were of a bright red colour, and were slightly raised above the surrounding skin. Five days later the purpura had increased, but the articular pain had disappeared. Then followed a return of pain in the right wrist and ankle, and he was admitted to the hospital, where he recovered completely in a few days, with rest and salicylic treatment. In this case the heart was not affected, the gums were healthy, and the temperature was only slightly raised. The urine yielded a cloud of albumen on boiling. Another man,

aged forty, who had suffered from rheumatic fever at the age of ten, and again at thirty-two, was seized with pain in the knees, thighs, and calves, and two days later with pain and swelling of the joints of the right hand. He presented a copious purpuric eruption on both legs, consisting of raised bluish-red spots, some of which were as large as threepenny-pieces. The gums were natural, the temperature was normal, and he had no cardiac murmur.

Dr. Arthur Schwarz has recorded two remarkable cases from Kaposi's wards in Vienna, in neither of which was any arthritis present, but in both of which endocarditis was developed, the active character of which was shown by the increase of the murmurs from day to day, and by the absence of any compensatory hypertrophy. In both cases the murmur was aortic and diastolic. In connection with such cases as these it must not be forgotten that when the endocarditis assumes the malignant form, emboli may become lodged in the cutaneous vessels, and these may give rise to a form of purpura which is purely secondary, and not a true rheumatic manifestation.

The study of rheumatic purpura is greatly complicated by the fact, upon which Scheby Buch has particularly insisted, that arthritis is frequently developed in the course of all diseases in which purpura is a symptom. That this is the case in scurvy and hæmophilia is well known, and Scheby Buch shows that the same holds good for purpura simplex and purpura hæmorrhagica. There is, indeed, much reason for believing that many cases of purpura simplex in which there is pain and swelling of joints have nothing whatever to do with true rheumatism, for the patients are often sickly and ill-nourished subjects, who exhibit no other manifestations of the rheumatic tendency. It is often a matter of great difficulty to determine whether any particular case is one of purpura rheumatica or merely of purpura with articular lesions, and the subject cannot be said to be as yet at all satisfactorily understood.

Erysipelas.—Perroud and other authors have included erysipelas among the skin-affections allied to rheumatism; but, as Besnier points out, although erysipelas may complicate rheumatism, as it may any other disease, the affection described by Perroud appears to have been rather of the nature of erythema than of true erysipelas.

Psoriasis.—Psoriasis is looked upon as a rheumatic affection by some authors, amongst whom is Dr. Goodhart, and an interesting but somewhat complicated case will be found reported by Sir Dyce

Duckworth in a recent volume of the Transactions of the Clinical Society, in which this affection, followed by pityriasis rubra, occurred in a rheumatic subject; but the association is certainly far less intimate than that which exists between rheumatism and the various erythematous affections already described.

Scleroderma.—There remains to be considered the possible remote relationship of the rare and remarkable skin-disease scleroderma to the rheumatic state. It is a noteworthy fact that a certain number of those who suffer from scleroderma are found to have had rheumatic fever or to come of rheumatic families. Ball mentions the rheumatic diathesis amongst the predisposing causes of this disease. Sir Dyce Duckworth remarks, "It is of interest to note that rheumatic affections appear to precede this disorder with some frequency;" and Letulle says, "Rheumatism, which is regarded by Verneuil as the favourable soil for the development of cutaneous sclerosis, constitutes indeed one of the less doubtful of the ætiological factors in certain cases." A remarkable case has been recorded by Dr. Radcliffe Crocker, which is strongly suggestive of some such connection. The patient was a girl aged thirteen, who had suffered from rheumatic fever four years before she came under his care, and who had a mitral systolic murmur. During the progress of the cutaneous disease the child suffered from a series of feverish attacks, each accompanied by the development of a pericardial friction-sound. On the other hand, when the published cases are collected, the evidence afforded is very far from convincing. Among thirty recorded cases, which I took without selection, there was not one in which it was mentioned that there was a family history of rheumatic fever, but the mother of one patient was said to have suffered from a rheumatic affection of the hands. One patient had suffered from rheumatic fever four years before the scleroderma came on, and another had pain and swelling of the finger-joints and wrists; a third had pain in the joints of both extremities, simultaneously with the appearance of the first patch of scleroderma; a fourth had suffered from rheumatic pains in the right shoulder for three years; in a fifth case the skin-affection was preceded by pain and swelling of the right wrist; and five other patients were stated to have suffered from rheumatism or joint pains. Two patients had mitral systolic murmurs, and one had mitral stenosis.

It will be seen that in ten cases, or one-third of the total number, some mention was made of articular lesions, and if it were possible to admit the rheumatic nature of the pains in all these cases, considerable evidence would be afforded of the existence of

a relationship between rheumatism and scleroderma; but in the majority of instances there was little or no evidence of the rheumatic origin of the lesions. Indeed, the changes in the joints which are associated with scleroderma resemble rather those met with in rheumatoid arthritis, or in the arthritis which follows definite nerve-lesions; a fact which lends support to the view that scleroderma is a dystrophic change in the skin, dependent upon some affection of the nervous system.

In some instances the stiffness of the joints appears to be due rather to the hide-bound condition than to any changes in the articular structures.

CHAPTER XVI.

SORE THROAT.

Pharyngitis and Tonsillitis.

Early references to rheumatic sore throat—Both pharyngitis and tonsillitis occur as rheumatic manifestations—The initial sore throat of rheumatic fever—Sore throat with slight articular symptoms—Possibility that some cases are examples of abortive scarlatina—Tonsillitis in the rheumatism of childhood—Sore throat with erythema—The influence of rheumatism in the causation of sore throat in general.

ALTHOUGH sore throat is present at some period in a very large proportion of all cases of rheumatic fever, it is only of recent years that its claim to rank as a manifestation of rheumatism has been at all widely recognised; and yet there may be found in the writings of several authors of the eighteenth century, such as Stoll, De Sauvages, and Musgrave, passages which suggest that they were acquainted with the association of throat-troubles with articular lesions. Stoll was the first to employ the name "rheumatic angina," but it would seem that he applied it to sore throat resulting from cold rather than to that which is attended by articular lesions. In his essay on rheumatic fever, which appeared in 1805, Haygarth mentions cynanche as a not uncommon antecedent of the attack, and adds: "Hence we learn that, as far as these cases afford instruction, persons who have been previously affected with the acute or chronical rheumatism, the gout, and sore throat are most liable to suffer from attacks of this disease, and ought, therefore, to be particularly careful to avoid exposure to coldness and moisture."

Among more recent authors, Bouillaud mentioned the association of sore throat with rheumatism in 1840; in 1865, Fernet, in his graduation thesis, gave a clear description of the clinical features of this form of throat-affection; and Ball in his work on "Visceral Rheumatism," as well as Trousseau and Desnos, described its characters. Cases of rheumatic tonsillitis were recorded by Dr. John Ogle in 1865; and in 1868 Lasègue devoted an admirable

chapter of his "Traité des Angines" to this subject. Mr. Lennox Browne was the first English author who called general attention to the frequent association of tonsillitis with rheumatism; and among more recent contributors to the study of this question the names of Mercier, Hallez, Piponnier, Kingston Fowler, Haig Brown, and Mantle may be specially mentioned.

There are considerable differences of opinion as to the variety of sore throat which is usually met with in association with rheumatism. Some observers, among whom are Lasègue and his pupils, describe a mere injection and œdematous swelling of the palate and fauces, with occasionally some secondary affection of the tonsils, whilst others attribute to rheumatism a large share in the production of tonsillitis also. These differences are rather apparent than real, for there can be no question that the rheumatic throat-affection assumes a variety of forms, and that the tonsils may escape entirely, or may be acutely inflamed. Indeed, it is true of the rheumatic sore throat, as of many other rheumatic manifestations, that there are no distinctive features by which its nature can be recognised in any given case, and the diagnosis is based upon the family and personal antecedents of the patients, or upon the association with it of other rheumatic phenomena. So far as my own experience goes, it agrees closely with that of Fernet, whose description I may quote: "If the throat be examined, a diffuse erythematous redness is seen to occupy the whole of the back of the throat, and some œdematous swelling of the mucous membrane is present, which is most marked about the uvula, which is swollen and elongated. The pharynx is moist, and free from all exudation; one or both tonsils may present more or less considerable swelling." Another point to which Fernet calls attention is well marked in many cases, namely, that the amount of pain is out of all proportion to the morbid appearances.

Lasègue divided the cases into three groups, according to the relative intensity of the throat-symptoms and the articular lesions.

The first group includes those cases in which the sore throat is a trifling affection, whereas the arthritis is severe. This is the condition which may be described as the initial sore throat of rheumatic fever, which is usually so slight and transitory an affection that the symptoms have disappeared before the joints are attacked. For this reason one seldom has an opportunity of studying the morbid appearances in hospital practice, and it is usually by hearsay alone that we know of its occurrence. There are, however, certain cases belonging to Lasègue's second group in which the throat-symptoms are sufficiently severe to lead the

patient to seek relief on their account, and they may even persist throughout the rheumatic attack. My own impression is that the transitory and slight sore throat which so often precedes rheumatic fever does not usually amount to more than a pharyngitis; but the observations of Dr. Kingston Fowler and others show that acute tonsillitis, and especially the follicular variety, is by no means rare under these conditions. When the tonsils are involved, the throat-affection is, as a rule, more severe and lasting, and therefore more likely to come under observation. The interval which separates the initial throat-affection from the other rheumatic symptoms varies in different cases, but is usually not longer than one or two days. In some patients each of a series of attacks of rheumatic fever is ushered in by sore throat, a fact which affords yet another example of the influence of individual peculiarities in moulding the characters of the disease. Dr. Kingston Fowler estimates the proportion of cases of rheumatic fever in which throat-symptoms are present at no less than 80 per cent.

There is a class of cases in which an attack of acute tonsillitis precedes rheumatic fever by a considerable interval; several weeks or months. In these the rheumatic nature of the throat-affection, although probable, is far less clearly established; but if it be granted that tonsillitis is one of the manifestations of rheumatism, it is probable that, like the other manifestations, it may occur as an isolated rheumatic event.

Lasègue's third group embraces those cases in which the angina is severe, whereas the articular lesions are trifling. Under this head may be included the large class of cases in which sore throat is attended or followed by articular pains, without any obvious swelling of the joints. That these pains are of rheumatic origin is rendered probable by the frequent association of similar pains with erythema and chorea, and by the fact that they are specially apt to occur in those sufferers from sore throat who have themselves had rheumatic fever at some previous period, or who come of rheumatic families. They were present in 29 out of a series of 169 cases of pharyngitis and tonsillitis which I recently tabulated,[1] and of these 29 patients, 4 had previously had rheumatic fever, and no less than 15 gave histories of rheumatic fever in members of their immediate families. I would, however, limit my statement to such pains as can be definitely localised in the joints. It is possible that in some of these cases the rheumatic symptoms are rather of the nature of complications of a throat-affection which is itself

[1] See *Brit. Med. Journal*, 1889, vol. ii. p. 584.

primary, and that they may stand in the same relation to an infectious sore throat as they so often do to scarlatina. Dr. Mantle has described outbreaks of epidemic sore throat in which rheumatism played a prominent part; and both this author and Dr. William Stewart, who has observed similar facts, point out that such outbreaks are apt to occur when scarlatina is also prevalent. Seeing that a sore throat may constitute almost the whole of a scarlatinal attack, it seems probable that some such cases are examples of abortive scarlatina. This introduces an additional element of difficulty into the subject; for we have to distinguish such cases from those in which the throat-affection is, to all appearance, a primary manifestation of rheumatism, which I believe constitute a far larger class.

Both Dr. Goodhart and Dr. Cheadle assign to tonsillitis a place among the manifestations of the rheumatic state which are met with in childhood, and the cases observed in children afford perhaps the most conclusive evidence yet brought forward of its occasional rheumatic origin. In an earlier chapter I have described two cases, in one of which the throat-affection was observed in association with arthritis, mitral disease, subcutaneous nodules, chorea, and erythema, and in another with mitral disease, erythema, and nodules. In such cases I have usually met with typical follicular tonsillitis, but sometimes there has been simply pharyngitis (see pp. 76 and 77).

The association of sore throat with erythema is by no means confined to early life, and an eruption of erythema multiforme or erythema nodosum in an adult is often ushered in by such symptoms, even when no other rheumatic lesions are present; a fact which lends support to the view advanced by Lasègue, that the rheumatic angina is nothing else than an erythematous affection of the fauces, of like nature with cutaneous erythema.

When sore throat is the leading feature of a rheumatic attack, there are seldom any associated cardiac lesions; but both pericarditis and endocarditis may occur even when articular pains are absent, as is shown by the instances quoted by Dr. De Havilland Hall and others in the discussion upon the relation of tonsillitis to rheumatism, which was held in the Laryngological Section of the British Medical Association in August 1889. Such cases are, nevertheless, sufficiently rare to emphasise the fact that the rheumatic sore throat is clinically associated with arthritis rather than with cardiac lesions.

There remains to be considered the question whether pharyngitis and tonsillitis can be shown to occur as isolated rheumatic manifestations, and to this question it is by no means easy to give

any very definite answer. In the Report of the Collective Investigation Committee on acute rheumatism, it is stated that of 655 patients, 158, or 24.12 per cent., had previously suffered from tonsillitis, and 20 others from sore throat of uncertain nature. Of the 158 patients, 27 were subject to tonsillitis, 6 of whom had tonsillitis in direct association with the rheumatic attack. In the remaining cases the angina preceded the rheumatism by various intervals, from one day to fourteen years, but in the great majority of instances the interval was less than twelve months. Approaching the question from the opposite point of view, Dr. Haig Brown obtained some rheumatic history in 76 out of 119 cases of sore throat, and Dr. Green estimates the proportion of cases of tonsillitis which are of rheumatic origin at two-thirds. In a paper read before the Laryngological Section of the British Medical Association in 1889, I gave the results of the study of 169 cases of pharyngitis and tonsillitis, and showed that among these there was something to suggest a possible rheumatic origin in about one-third of the cases of each variety; that is to say, that in this proportion of cases there was either a family or personal history of rheumatic fever, or there were associated rheumatic symptoms, articular pains being looked upon as such. Of the patients with tonsillitis, about one-quarter gave family histories of rheumatic fever in near relations; and of those with pharyngitis, rather more than one-third gave similar histories. Among non-rheumatic patients, I have, as has already been stated, found the proportion of such histories to be about one-fifth. On the other hand, in very many instances the evidence of rheumatic origin was very slight indeed, and it is probable that the proportion of one-third is considerably above the truth.

Note.—In a paper which appeared after the earlier chapters of this book were in print (*Brit. Med. Journal*, 1890, i. p. 472), Dr. B. N. Dalton contends that sewer-gas plays an important part in the causation of rheumatic fever; and in support of this view quotes examples from his own practice, in which the appearance of the disease appeared to be attributable to imperfections of drainage. If further observations should confirm Dr. Dalton's views, important light may be thrown upon the origin of the "house epidemics" which Edlefsen describes. Dr. Dalton is inclined to attribute the association of rheumatism with tonsillitis and scarlatina, and the occurrence of rheumatic or rheumatoid pains in association with other specific fevers, to a mixed infection of drain-gas containing various kinds of morbific organisms. The possible dependence of rheumatism upon sewer-gas was also suggested by Dr. Haig Brown in his most recent paper on tonsillitis and rheumatism (*Brit. Med. Journal*, 1889, ii. p. 582), in which he describes the instance of a large public institution in which improved sanitation had been followed by a reduction of the frequency of both tonsillitis and rheumatism.

CHAPTER XVII.

SUBCUTANEOUS RHEUMATIC NODULES; AND PERIOSTEAL NODES.

Historical sketch—Nodules especially met with in childhood—More common in girls than in boys—Ages—Duration of the nodules—Number—Situations—Exciting causes unknown—Clinical features—Association with valvular disease—This association not invariable—Morbid anatomy—Diagnostic value of subcutaneous nodules—Their analogy with endocardial vegetations—Earlier references to rheumatic periostitis—Examples of periosteal nodes appearing in the course of unequivocal rheumatic attacks.

THE remarkable subcutaneous nodules, which form such striking features in many cases of rheumatism, although they are the most recently recognised manifestations of the disease, have a particular interest and are of great diagnostic value. Such peculiar excrescences must have been frequently noticed before their significance was recognised, and, as Dr. Cheadle has pointed out, an admirable description of a case in which they were developed, in association with chorea and endocarditis, is contained in Dr. Hillier's work on the "Diseases of Children," which was published in 1868. Attention was first called to the rheumatic origin of these nodules by M. Meynet of Lyons in 1875, and on this account they are often spoken of as the nodules of Meynet; he observed them in the case of a boy aged fourteen, who had come under his care in the preceding year. Besnier classed this case with some which had been described by Froriep and Jaccoud, but an examination of their observations shows that the conditions which these authors described were of an entirely different nature, for the nodules of Froriep were muscular indurations, and those of Jaccoud, which were only appreciable to the touch, were fixed to the skin, and differed entirely

in their distribution. A second case, similar to Meynet's, was recorded by Rehn in 1878. In March 1881 there appeared a paper by Dr. Hirschsprung of Copenhagen, in which he described four well-marked cases of rheumatic nodules, the first of which had attracted his attention in 1875, while he was still unacquainted with Meynet's description. In August of the same year Drs. Barlow and Warner laid before the International Medical Congress, then sitting in London, their classical paper on this subject, which embodied observations of a series of twenty-seven cases. Their first observation, like that of Hirschsprung, dated from 1875. In 1882 and 1883 MM. Troisier and Brocq contributed cases, and since then many other observations have been placed on record, and subcutaneous nodules have taken their place amongst the recognised manifestations of the rheumatic state.

Hirschsprung was the first to call attention to the association of the nodules with serious cardiac lesions, and this was strongly emphasised by Barlow and Warner, and fully borne out by their far larger series of cases. These observers, arguing from the frequent concurrence of these two rheumatic phenomena, and the similarity of the histological structure of the nodules to that of endocardial vegetations, suggested that nodule-formation and endocarditis were analogous processes, both being characterised by the development of new connective tissue (figs. 7 and 8). This truly scientific suggestion has since met with very general acceptance, and more recent observations have only tended to confirm the view that the two processes advance side by side; and although cases occur in which crops of nodules are developed while the heart shows no evidence of disease, such cases are quite exceptional.

Nodule-formation is a special feature of the rheumatism of childhood, but they are occasionally met with in young adults in the course of an attack of rheumatic fever, and a few cases have been placed on record in which nodules, apparently of this kind, have been developed in later life. If systematically sought for in all rheumatic children, they will be found to be far less rare than is usually supposed, but they are so ephemeral that it is to some extent a matter of chance whether the patient comes under observation during the time in which the nodules are present. Like other rheumatic manifestations, they appear to be much commoner in girls than in boys. Of Barlow and Warner's 27 patients, 17 were girls and 10 were boys; and of Hirschsprung's four cases three occurred in girls. Of 16 cases, of

which I have notes, 12 occurred in females, and the ages of the patients were as follows:—

Females.

Ages.	No. of Cases.
7 years. ...	1
8 „ ...	2
11 „ ...	2
13 „ ...	1
14 „ ...	1
15 „ ...	1
16 „ ...	1
17 „ ...	1
18 „ ...	1
22 „ ...	1

Males.

Ages.	No. of Cases.
14 years. ...	2
15 „ ...	1
20 „ ...	1

Their development is often very rapid, and a well-marked nodule may sometimes be found in a situation in which there was no sign of one on the previous day. The duration of the process varies within wide limits, but, when they are present continuously for several months, fresh ones, as a rule, form and take the place of others which have disappeared. The entire period of evolution and resolution of a single crop may occupy only a few weeks, or even days. The number of nodules is also subject to great variety. Sometimes only two or three very small ones are observed, whereas in other cases large numbers may be distributed over the trunk and limbs. The commonest situations of all are the bony prominences about the elbow-joints, and over the extensor tendons of the hands, and next to these along the margins of the patellæ. On the head they are found upon the protuberances of the parietal and occipital bones, also along the sutures, and less commonly upon the frontal bones, and even upon the pinnæ of the ears. On the trunk, the spinous processes of the vertebræ and the clavicles are the commonest seats, and they are less commonly found upon the ribs, the crests of the ilia, the spines and edges of the scapulæ, and upon the sternum; on the arms, they are met with upon the acromion, the styloid processes of the radius and ulna, the heads of the phalanges, and rarely upon the flexor tendons, as well as in the situations first mentioned. On the lower extremities, besides the patellæ, the condyles of the femora, the malleoli, the extensor tendons of the foot, and the edge of the peroneal fascia are recognised seats; and I have once seen a nodule upon the shaft of the tibia. Lastly, Drs. Barlow and Angel Money have met with structures resembling these nodules on the pericardium.

The following table, which is compiled from fifty cases, published and not published, will serve to convey an idea of the relative frequency of their development in some of the more usual situations:—

Seat.	No. of Cases.	Seat.	No. of Cases.
About the elbow in	37	On the head in	10
„ hand in	30	About the shoulder in	9
„ knee in	20	„ hip in	7
„ ankle in	16	On the scapula in	6
On the vertebral spines in	10	„ clavicle in	5

In some instances the distribution of the nodules is remarkably symmetrical, and it is not uncommon to find them upon the

Fig. 4.—Small Rheumatic Nodules situated upon the Tendon of the Palmaris Longus.

corresponding tendons of the two hands, or in similar positions upon the two patellæ or scapulæ. In the case of a child who was under my care, and who had five nodules only, one was situated upon the left parietal protuberance, one upon the same

part of the flexor tendon of each ring-finger, and one upon the outer border of each patella; and in another case I have seen a complex arrangement of nodules upon the one scapula exactly reproduced upon the other; but, as is the case with rheumatic arthritis, such symmetry is by no means invariable, and in many instances the distribution is far from orderly.

It has been suggested by Dr. Drewitt that pressure and the friction of clothes are factors determining, to some extent, the position of the nodules; but although it is possible that such influences may sometimes play a part, it is by no means rare for nodules to form in protected situations, while those in which pressure and friction are greatest escape; their symmetrical arrangement is also opposed to such an explanation.

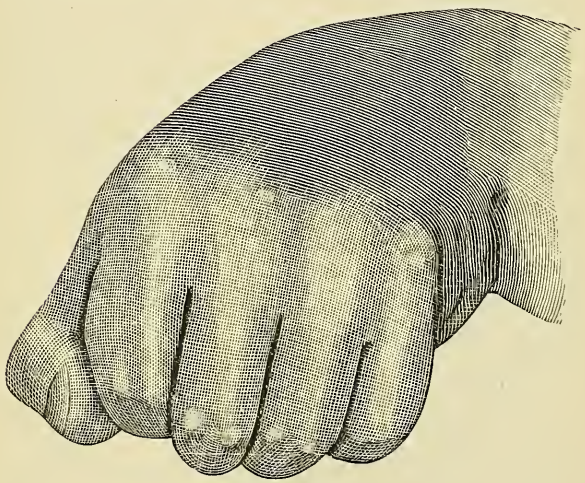


Fig. 5.—Hand of a Girl aged Ten with Subcutaneous Rheumatic Nodules.

The nodules appear as small conical or rounded elevations, varying in size from small lumps, only just appreciable to the touch, to the dimensions of an almond; and when large, they often have an oval instead of a circular outline. When situated upon the backs of the hands, they at once attract attention, especially when the fingers are flexed. The skin, which moves freely over them, preserves its natural character. When situated upon the tendon-sheaths or fasciæ, the nodules are movable, to some extent, upon the underlying structures; but those which rest upon bony prominences are fixed, and can only be distinguished from bone itself in virtue of a certain degree of elasticity which they possess. During the period of resolution,

however, they usually become much softer, and may even feel like small fatty tumours. In the earliest stages of their development the nodules are in some few cases slightly tender, but in the great majority of instances they may be handled or pressed upon without pain. The appearance of the nodules is sometimes preceded by a rise of temperature, a fact to which Dr. Coutts has particularly drawn attention. In no less than twelve of the sixteen cases to which I have already referred, there were definite signs of valvular disease; in two others there were less positive signs, and in two only was no cardiac murmur heard.

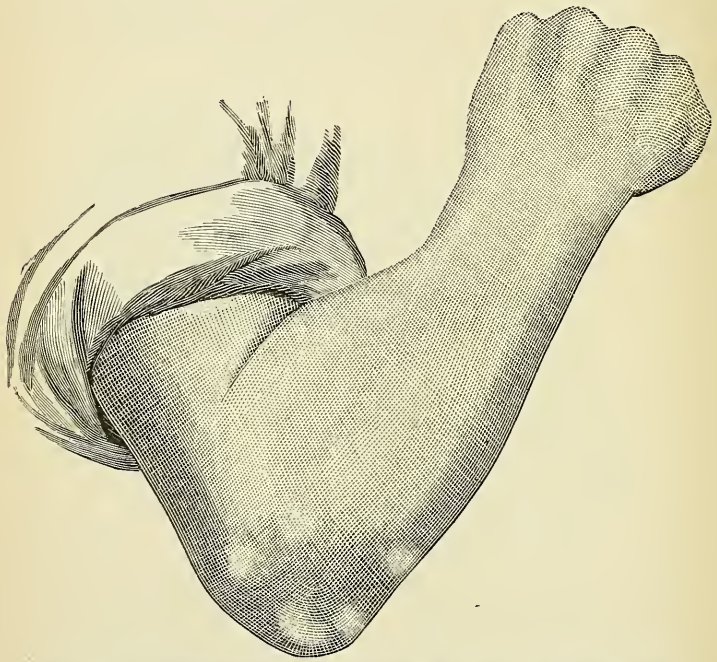


Fig. 6.—Subcutaneous Rheumatic Nodules on the Elbow of a Boy aged Sixteen.

Sometimes the development of a murmur coincides with that of the nodules; and even when the heart has already been seriously damaged by previous endocarditis, the cardiac trouble is apt to increase during the period of nodule-formation. This was well exemplified by the case of a boy whom I had under observation for a long time. When first seen, he had numerous large nodules upon the elbows and knees (fig. 6), but only complained of very trifling articular pains, which soon disappeared under treatment. He was found to have mitral stenosis and regurgitation, probably dating from an attack of rheumatic fever from

which he had suffered four years previously. At first he had no cardiac symptoms at all, and he had been in the habit of playing football up to the time when I first saw him; but during the five or six months during which successive crops of nodules appeared, heart troubles came on, which ultimately necessitated his admission to the hospital, where he developed an aortic diastolic murmur in addition to the older mitral lesions. As a contrast to this, I may mention the case of a young man aged twenty, who presented himself with a small crop of nodules and with subacute articular rheumatism. This patient was never found to have a cardiac murmur, although his heart was repeatedly auscultated by myself and others during a period of six months. Cases such as this, in which the heart is found to be natural, although nodules are present, are decidedly exceptional. Dr. Cheadle lays especial stress upon the serious prognostic significance of large nodules, which are not only often associated with grave endocardial lesions, but also in many instances with fatal pericarditis.

The nodules when removed from the body are found to be ovoid or spherical in form, and somewhat translucent; and they have been compared to boiled sago grains, which they somewhat resemble in appearance. It is sometimes a matter of difficulty to find them *post-mortem* in situations in which they were conspicuous during life. They are attached to the tendon sheaths, to the deep fasciæ covering the bony prominences, or to the pericranium. In some instances their positions are marked by small indentations in the subjacent bone, which are probably due to pressure. In section they are found to consist simply of connective tissue undergoing active proliferation (fig. 8).

The question of the diagnostic value of these structures is one of great interest. Dr. Cheadle speaks of them as the only members of the group of rheumatic manifestations which are "absolutely and solely rheumatic," never stirred up, as far as he knows, "by any stimulus except the rheumatic stimulus;" and such evidence as is forthcoming lends much support to this view. It might, however, be urged that if the nodules are similar in structure, and strictly analogous to endocardial vegetations, any morbid process which is capable of causing endocarditis might give rise to the formation of nodules also. There are many who hold that the endocarditis of chorea is by no means always rheumatic in its origin, and it is an unquestionable fact that nodules are sometimes met with in cases of chorea with endocarditis, in which there are neither rheumatic family histories nor any articular lesions. Is the presence of nodules in such cases absolute

evidence of the rheumatic origin of the endocarditis? As an answer to this question, I can only repeat what was said in speaking of chorea, that, apart altogether from the occurrence of nodules, there seems to me to be very good reason for believing that the

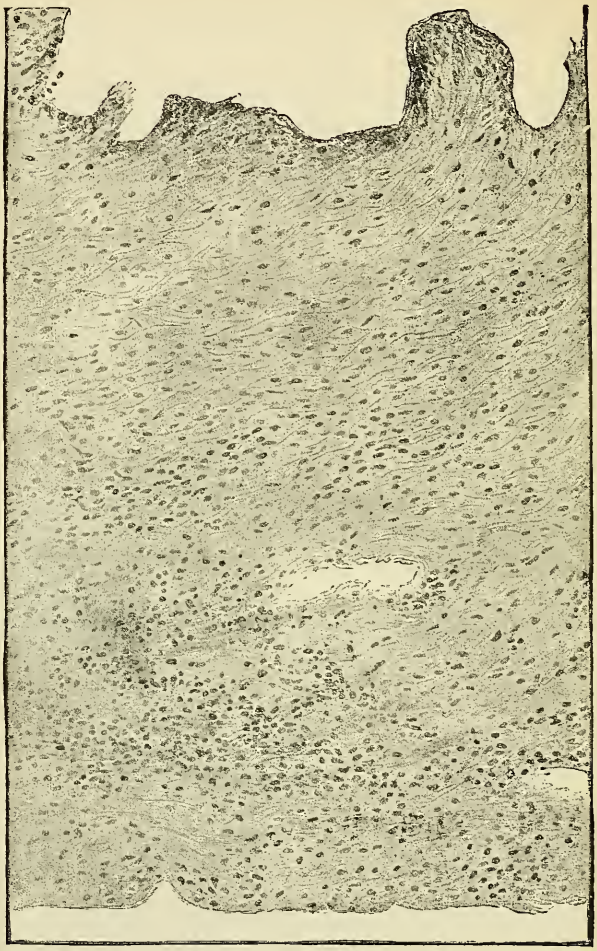


FIG. 7.—Section of Mitral Valve in a Case of Rheumatic Endocarditis in a Child, showing Proliferation and Cell-Infiltration of Subendothelial Fibrous Tissue. (From Dr. Cheadle's Harveian Lectures on the Manifestations of the Rheumatic State in Childhood and Early Life.)

endocarditis of chorea is always rheumatic. Dr. Drewitt and Dr. William Stewart have met with these tumours in connection with attacks of scarlatinal rheumatism, and, if they are pathognomonic, in these cases at least, the articular affection must have been truly rheumatic. This only tends to confirm the conclusions based upon

quite different lines of argument, all of which point to the truly rheumatic nature of scarlatinal rheumatism. In the enormous majority of cases the nodules appear in association with undoubted articular or abarticular rheumatism, and I know of no instances in which they were developed in connection with septic endocarditis, or with any other condition not in some obvious way asso-

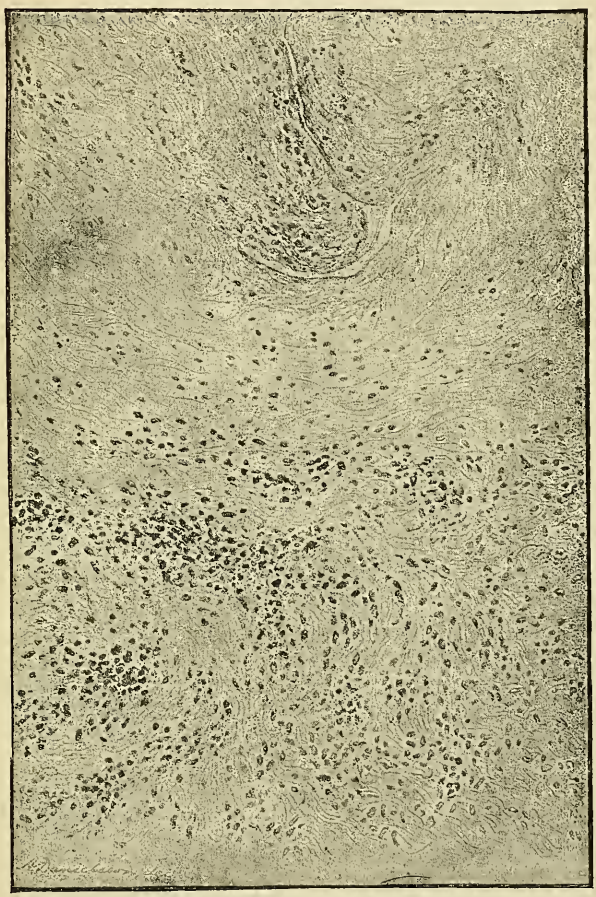


FIG. 8.—Section of Subcutaneous Nodule in Acute Rheumatism, showing similar Active Proliferation and Cell-Infiltration of Fibrous Tissue. (From Dr. Cheadle's Harveian Lectures.)

ciated with rheumatism ; it should, however, be mentioned, that in some of the earlier recorded cases in which nodules, which showed no tendency to disappear during a long period of watching, were observed in adults, there was no evidence of previous rheumatic manifestations. Much may certainly be said in evidence of the pathognomonic character of these subcutaneous nodules,

and if this evidence is trustworthy, it has still more important bearings; for if all the forms of endocarditis with which their formation is associated are to be included in the rheumatic group, we cannot escape the conclusion that, with a few possible exceptions, all cases of endocarditis fall under one of two heads—the rheumatic and the septic; and that the occurrence of simple endocarditis affords nearly as strong evidence of the activity of the rheumatic process as do the nodules themselves.

Periosteal Nodes.—A number of observers have included periosteal nodes among the manifestations of rheumatism. Fuller describes a condition which he calls periosteal rheumatism, which is apt to occur in cachectic subjects, and in which the periosteum is thickened, painful, and tender on pressure. The commonest seats of such thickenings were the tibiæ, ulnæ, clavicles, sternum, and cranium. He states that such cases may be met with amongst those who have never suffered from syphilis, but mentions that disease among the depressant causes which specially favour the development of such nodes. M'Leod gives a very similar description of periosteal rheumatism, but other observers have denied that rheumatism has any share in the causation of periostitis. It is obvious that any case in which evidence of syphilis can be obtained is of little value, especially when it is remembered that some degree of arthritis not infrequently attends syphilitic periostitis of the neighbouring long bones. I have seen patients who have been treated for months on the assumption that they were suffering from rheumatism, and who presented this association of morbid phenomena; and in such cases the joint-lesions and periostitis usually yield rapidly to iodide of potassium.

At the meeting of the Association Française pour l'Avancement des Sciences at Blois in 1884, M. Verneuil read a communication upon certain ephemeral affections of the periosteum, of rheumatic origin. In this paper he related the case of a woman aged forty-four, who had suffered from several attacks of rheumatic fever, and who developed periosteal nodes on the right arm, temple, superior maxilla, nasal spine, occiput, and upon the inner side of the right tibia. There were no indications of syphilis, but the evidence of rheumatic origin was derived merely from a previous history of rheumatism, and from the relief afforded by the administration of sodium salicylate. In a second case the patient was suffering from uterine cancer, and the appearance of the nodes at first suggested that they might be secondary tumours. In this case also the evidence of rheumatic origin was by no means conclusive. In the discussion

which followed M. Verneuil's paper, MM. Potain, Dupluoy, and others mentioned similar cases which they had observed.

In the *Archives Générales de Médicine* for 1885, MM. Reynier and Legendre discussed rheumatic affections of the periosteum at some length. These authors distinguish two varieties of rheumatic periostitis, an acute and a subacute, and under the latter name describe the subcutaneous nodules. The cases of the more acute form which they quote closely resemble those recorded by Verneuil, both in the character of the nodes and in the absence of associated rheumatic lesions. Nevertheless periosteal nodes are occasionally developed in the course of undoubted rheumatic attacks, which must be carefully distinguished from those isolated nodes of erythema which, when situated over the tibia, may so closely resemble periosteal lesions.

Dr. Coutts and I have recently recorded three cases in which nodes, which had all the characters of periosteal swellings, developed on the subcutaneous surface of the ulna in connection with unequivocal rheumatic manifestations. Two of the three patients were children, and the third a young adult. In each case there was cardiac murmur, apparently organic, and in each subcutaneous nodules were or had been present. My own patient was a man aged twenty-four, who was suffering from a first attack of subacute rheumatism, in the course of which he developed a systolic mitral murmur, which almost disappeared later. The node upon the ulna, which was oval, with its long axis in that of the limb, was first noticed after the disappearance of a single nodule, upon the neighbouring olecranon process, and it disappeared in about three weeks, leaving only a hardly perceptible thickening. The patient denied syphilis, and there was nothing to suggest that he had ever had that disease. He afterwards came under my care with a fresh attack of subacute rheumatism, and with a loud systolic murmur, but no fresh node formed. Another case which I have had under my care, presented well-marked differences of character, both in the absence of any associated endocarditis or nodule-formation, and in the rapidity with which the nodes disappeared. The patient was a little boy, aged four years, whose father was said to be rheumatic, and one of whose brothers suffered from pains in the joints. He was attacked with pains in the limbs on May 26, 1888, and when I first saw him, on the 31st, he could not walk, nor could he lift his arms. He resisted flexion of the arms and legs, and the right elbow was somewhat swollen. A lump was felt in the muscles of the right forearm, which was said to have appeared

on the previous day. There was no cardiac murmur, and no nodules were found. On June 2nd the muscular lump was smaller, but a fresh lump was found on the right ulna, which felt like a periosteal node. The articular pains were less. On June 4th the muscular lump was gone, but some more periosteal swellings were found, two upon the right ulna, and one upon the left. The articular pains had again increased. On June 11th the old lumps had disappeared, but there was a fresh one upon each olecranon process. Dr. Cheadle kindly saw the child, and regarded the case as rheumatic, and the swellings as periosteal. On June 21st the swellings were almost gone. The temperature throughout was only slightly raised above the normal.

CHAPTER XVIII.

MYALGIA.

Painful affections of muscles are not uncommon as manifestations of rheumatism—Such truly rheumatic myalgiæ probably constitute but a small proportion of the cases of so-called muscular rheumatism—Views of Senator and Besnier upon this point—Gout a potent cause of myalgia—Myalgia as a symptom in other diseases than rheumatism and gout—The true seat of the pain as yet unknown—Muscular swellings (*Rheumatische Schwiele*)—Clinical features of muscular rheumatism.

Painful affections of muscles, unattended by any objective signs of inflammation, must certainly be ranked among the manifestations of rheumatism. At the commencement of an attack of rheumatic fever, before the nature of the case is revealed by the development of the articular symptoms, the patient often complains of muscular pains, which are usually most intense in the limbs or in the sterno-mastoids. Nor are such pains uncommon at later periods of the attack, although they are generally masked by the much more severe pain which results from the articular lesions. I am also convinced that muscular pains are not infrequently true rheumatic manifestations, although they may not be attended by any other rheumatic symptoms. Patients who have passed through an attack of rheumatic fever, or who readily experience slighter articular pains after any unusual exposure, sometimes complain of pain and stiffness of muscles, which may accompany or alternate with the pain in the joints. It is not common, however, for such pains to attain to any great severity. On the other hand, it is probable that such truly rheumatic myalgiæ constitute but a very small proportion of the cases which are grouped together under the comprehensive name of muscular rheumatism.

Lumbago and the other more severe forms of myalgia have long been regarded by many physicians as varieties of true rheumatism, and they were included as such by Sydenham,

apparently in opposition to the prevailing opinion at the time when he wrote. On the other hand, there have always been those who have held that there is no sufficient evidence that persons who are subject to articular rheumatism are especially liable to the muscular form. Senator, who holds most strongly that no such connection has been established, speaks of muscular rheumatism as including "all the painful affections of muscles, their tendons and fasciæ, which are of indefinite ætiological or morbid anatomical relations, or both, and which, therefore, cannot be included in any of the better-defined categories," and adds: "The existence of this morbid group is only justified by our ignorance of certain diseases associated with pain in the muscular apparatus, and the practical necessity of calling these by some name or other."

Besnier, who holds the opposite view, says: "It is easy enough, in theory, to contest the rheumatic nature of a great number of these manifestations in the imperfect state of our knowledge of the nature of rheumatism itself, and to regard them as simple myalgiæ due to cold, whenever they do not coincide with articular symptoms or other acknowledged rheumatic manifestations; but it would be an error in practical medicine not to attribute them to a general condition, inherent in the individual, which is most commonly rheumatism or gout, or, if it be preferred, the arthritic state, the most usual source of painful affections of muscles, and of all their dependencies, fibrous, aponeurotic, and periosteal." The introduction of the gouty element alters the ground of contention, for there can, I think, be little doubt that the gouty state is one of the most potent causes of the conditions included under the name of muscular rheumatism, and I have already pointed out, in an earlier chapter, that the conditions under consideration being products of both rheumatism and gout, it is in many cases a matter of great difficulty to diagnose which of these agencies is at work.

There is, however, reason to believe that a patient may suffer from lumbago and other forms of muscular rheumatism after exposure to cold, or after a strain, in spite of his being entirely free from both the rheumatic or the gouty tendency, and therefore that muscular rheumatism is not alone sufficient to prove the presence of either diathesis. Myalgia is, moreover, a prominent symptom of a variety of disorders; it is met with in many infectious fevers, in certain forms of chronic poisoning, as the result of gonorrhœal infection, and so forth, and, as Senator points out, as soon as the true nature of any variety of muscular pain is

clearly recognised, it is at once removed from the obscure category of muscular rheumatism. At the same time, it must be confessed that the development of myalgia in the course of several diseases in which the joints are especially liable to suffer, especially in rheumatism, gout, and gonorrhœal arthritis, does lend some support to the view that there is a peculiar tissue-state which predisposes to all these diseases alike, and which may be styled the arthritic diathesis.

As to the precise seat of the pain of muscular rheumatism, nothing is at present clearly known. Some observers have regarded the affection as a neuralgia of the muscular nerves; others have thought, with Oppolzer, that there is an actual inflammatory process in the diseased muscle, which is much less intense than that which is present in the rare condition known as myositis. Hayem asserts, moreover, that in acute articular rheumatism there are almost constantly present signs of actual inflammatory changes in the muscles near the inflamed joints, when an opportunity is afforded of examining these *post-mortem;* and he believes that these changes are sometimes primary, and sometimes due to extension of inflammation. Arguing from this, as well as from the clinical features of muscular rheumatism, Besnier suggests that the lesions of this affection are of a hyperæmic nature, with exudation occasionally, thus resembling many other rheumatic lesions.

In favour of this view is the fact that actual localised swellings are sometimes met with in muscles which are the seats of the so-called muscular rheumatism. These swellings were originally described by Froriep under the name of "*Rheumatische Schwiele*," and have since been observed by Virchow and many others, and this sometimes in cases which were apparently of truly rheumatic origin. Such muscular swellings were noticed in the case of a little boy aged four, who afterwards developed periosteal nodes, and whose symptoms I described when speaking of rheumatic periostitis.

The conditions grouped together under the name of muscular rheumatism agree in certain clinical features. In all, the pain is greatly increased, or only felt when the affected muscles are brought into action or are put upon the stretch. This feature is well marked in cases of lumbago, and the great intensification of the pain which is observed when the patient stoops down affords a valuable aid in the diagnosis of this affection from other disorders in which lumbar pain is a prominent symptom. The affected muscles are usually tender when handled or pressed upon,

and this again is an important feature, enabling us to distinguish the more superficial muscular pain from affections of deeper structures. Muscular rheumatism may have an extremely acute onset, so that the patients often state that they were suddenly set fast with lumbago, and in such cases the attack is not, as a rule, of long duration; on the other hand, the pain may increase gradually, and the affection may last so long as to be correctly styled chronic. In acute cases there may be a considerable elevation of temperature for a time. Almost all muscles are liable to attack, and a variety of names are in use to designate the seat of the myalgia, such as stiff-neck or torticollis, lumbago, pleurodynia, and the like.

CHAPTER XIX.

SOME RARE ACCIDENTS OF RHEUMATIC ATTACKS.

Rheumatic peritonitis—Its rarity—Examples quoted—Hydrocele—Orchitis—Cystitis—Jaundice—Diarrhœa—Albuminuria—Hæmoglobinuria—Acute rheumatic nephritis—Examples quoted—Association with pericarditis—Acute thyroiditis—Lymphadenitis—Affections of the eye—Conjunctivitis in rheumatic fever—Doubtful rheumatic origin of the so-called rheumatic iritis—Relation of eye-affections to the rheumatic diathesis—Phlebitis.

Peritonitis.—Although the pericardium is one of the seats of election of the rheumatic lesions, and the pleuræ are not unfrequently affected, rheumatic peritonitis is extremely rare. If it be the case that rheumatic pleurisy is generally set up by an extension of the inflammatory process from the pericardium, its relative frequency is not difficult to understand, for the obstacle opposed by the diaphragm to a similar extension of inflammation to the peritoneum is considerable. The comparative immunity of the abdominal serous membrane is shared by the abdominal viscera, which are very seldom attacked in comparison with those which lie in the cavity of the thorax.

Not a few cases have been recorded as examples of rheumatic peritonitis, but many of these are open to question, and in the remainder the possibility of accidental association must not be left entirely out of account. However, among the cases which I have been able to find, there are a few which seem hardly to admit of any other interpretation than that the peritoneal inflammation formed an integral part of an attack of rheumatic fever, and the most important of these were recorded by Fuller, Marmonnier fils, and Blachez. Dr. Fuller's case was that of a girl aged eighteen, who was admitted to St. George's Hospital with arthritis of many joints, endocarditis, and pericarditis. Under treatment the condition of the heart and joints began to improve, but on the twelfth day after admission right pleurisy developed, and subsequently the other pleura was also involved, and the

signs of left pneumonia were observed. Then, when the patient's powers were rapidly failing, peritonitis supervened, and she succumbed to a fresh attack of pulmonary inflammation. At the autopsy there was abundant evidence of recent pericarditis and endocarditis; there was a copious effusion of lymph and serum into both pleuræ; the left lung was in a condition of red hepatisation, and in the peritoneal cavity were bands of recent lymph together with turbid serum.

Marmonnier's patient was a woman who had suffered from rheumatic fever twice previously; both attacks had run a normal course, and in neither was the heart affected. The third attack commenced with pain and swelling of the knees, followed by similar affection of the ankles, wrists, and right elbow. Other joints became involved later, but the heart, as on the previous occasions, escaped damage. Six days after the commencement of her illness the patient was suddenly seized with severe abdominal pain, and her abdomen was found to be tense, tympanitic, and extremely tender when touched, especially in the hypogastric region. The pulse was rapid, beating 115 to the minute, was small and hard. The onset of the peritonitis was not attended by any diminution of the articular troubles. On the following day the patient's condition was still worse, and, in spite of treatment, vomiting, which had set in at the onset of the abdominal symptoms, became so severe that the patient brought up everything that she took. The pulse and respirations were rapid, the tongue was red at the tip and dry, and the urine was scanty and high coloured. By the following day a very marked improvement had taken place, and a day later the abdominal symptoms had almost entirely disappeared. There was, however, frequent cough, and rusty sputum was expectorated. Physical examination revealed dulness over the upper half of the right lung, and a crepitant râle was heard over the same area. The pneumonia spread, and soon involved the entire right lung, and also the left base, but its duration was short. The patient made a good recovery, and was able to resume her ordinary occupation forty-nine days from the commencement of her illness. Blachez's patient was a young lady aged twenty-two, who, two days after an exposure to the night air in thin clothes, was attacked with febrile symptoms, pain in the shoulders, and developed an itching eruption upon the neck. Then many joints were attacked in succession, the wrists and knees being the first, and at the end of a week very acute endocarditis and pericarditis were developed. The pleuræ were next involved, first the left, and afterwards the right; and after a

temporary improvement, the patient was seized with abdominal pain and vomiting, and the pulse-rate increased to 116 in the minute. At the same time the abdomen became tympanitic and tender. On the day following the onset of the peritonitis the vomiting ceased entirely, and the abdominal tenderness rapidly diminished, but the patient became delirious, and passed into a state of coma, in which she died. No autopsy was made. Blachez mentions that no special cause could be assigned for the development of the peritonitis, and that the catamenia had appeared normally during the early days of the patient's illness.

It will be noticed that these three cases agree in several remarkable points. In all, peritonitis was associated with grave pulmonary lesions, and in two it is stated that the onset of the abdominal symptoms was sudden, and their disappearance unusually rapid, as is the case with so many of the rheumatic inflammations.

Hydrocele—Orchitis.—Notta, Fernet, and other observers have included affections of the testicle and tunica vaginalis among the rarer accidents of the rheumatic state, but the case described by Notta, in which effusion into the tunica vaginalis was observed, occurred in a patient who had recently suffered from gonorrhœa, and although the discharge had ceased some time before the onset of the articular symptoms, the case can hardly be accepted as proving the occurrence of so rare an accident, as a manifestation of rheumatism. M'Leod speaks of orchitis as an occasional complication, and Besnier describes the occurrence of a form of orchitis similar to that met with in mumps, affecting one or both testicles, not outlasting the rheumatic attack, but followed occasionally by atrophy of the organ.

Cystitis.—Cystitis has been met with in the course of rheumatic fever by Lebert, Senator, and others, and Homolle states that rheumatic patients are more liable than sufferers from other febrile disorders, to irritation of the bladder as a result of the employment of blisters.

Jaundice is occasionally developed in the course of rheumatic fever, but so rarely that it may well be questioned whether it is not in such cases the result of the same exposure which provoked the rheumatic attack. Lieblinger has collected a series of cases of this kind. He regards the jaundice as a true rheumatic manifestation, which he attributes either to some alteration in the chemical composition of the bile, or to a rheumatic inflammation of the mucous membrane of the bile-ducts. It must not be forgotten that jaundice may occur as a symptom

of ulcerative endocarditis, and it has been suggested that its occurrence in the course of rheumatic fever is in some cases to be attributed to the supervention of this malignant type of cardiac affection.

Diarrhœa.—Diarrhœa, accompanied by abdominal pain and the occasional admixture of blood with the stools, has been observed by Besnier, Homolle, and other observers in connection with acute rheumatism; but more commonly such intestinal disturbances, occurring in patients of rheumatic tendencies, are referred to the rheumatic or arthritic diathesis, in spite of the absence of any definite rheumatic symptoms at the time.

Albuminuria.—In rheumatic fever, as in other acute febrile diseases, albumen is occasionally present in the urine, but the quantity is usually very small, and is seldom more than sufficient to yield a light cloud on boiling. As a rule, it is observed for a short time only. Nowadays the occurrence of such slight albuminuria is usually attributed to the employment of salicylates, which appear even to have the power of producing nephritis when given in too large doses; but slight albuminuria was not uncommon before the introduction of these drugs, and in my father's old hospital note-books I find its occurrence recorded in a considerable number of cases. Besnier holds that the only truly rheumatic lesion of the kidneys is a superficial catarrhal nephritis, and he ascribes all cases in which a large amount of albumen is present in the urine of patients suffering from acute rheumatism, either to the lodgment of emboli in the renal arterioles; to an accidental concomitant nephritis; to the occurrence of some rare form of hæmorrhagic rheumatism, or to the poisonous effects of cantharides. In the case of the slighter forms of albuminuria, its extremely transitory character shows that it is not due to mere mechanical congestion resulting from cardiac lesions, and it can only be regarded as a consequence of the febrile disturbance. The cases in which it is met with are, as a rule, of a severe type, and in them the heart is, usually, affected. Among fifteen cases taken from hospital note-books, in which slight albuminuria was at some time present, some of which were treated with alkalis, some with sodium salicylate, I find pericarditis alone noted in one, endocarditis and pericarditis in five others, endocarditis alone in six, and in three only were there no cardiac lesions.

Hæmoglobinuria.—In a case under the care of Sir Dyce Duckworth, in which both cardiac lesions and pneumonia were present, I, on one occasion, found the urine of a bright pink

colour, perfectly limpid, but showing the oxyhæmoglobin bands with the spectroscope. On the following day the urine had resumed its natural appearance and no longer contained any albumen. M. Hayem has recorded a case in which hæmoglobinuria, with albuminuria and casts, was observed in the course of an attack of rheumatic fever, and in the discussion which followed M. Hayem's paper, M. A. Robin mentioned some similar cases which he had seen, and the conclusion arrived at was that hæmoglobinuria might be the earliest indication of the onset of an acute rheumatic nephritis. In Hayem's case the hæmoglobin disappeared from the urine in rather more than a week, but the albumen and casts persisted for a few days longer. An examination of the blood during the time that the hæmoglobin was being passed revealed no abnormality of the serum.

Nephritis.—No doubt, in some instances, the nephritis of acute rheumatism is of embolic origin, and the "*nephrite rhumatismale*" which Rayer described was certainly of this nature, as was demonstrated by the *post-mortem* examination of the affected kidneys. There are, nevertheless, cases in which no grounds exist for suspecting such an origin, nor can it be supposed that in all such cases the nephritis is due to the application of blisters, for they were not particularly met with among those patients who were treated by the free application of blisters to the joints, according to the plan so strongly recommended by Dr. Herbert Davies, and it is unlikely that a blister applied to the præcordial area should produce such serious results. It is, of course, possible that in some of the cases the rheumatism is really the sequel of a very slight attack of scarlatina, of which the nephritis is an independent manifestation, but it is hardly credible that, if this were the case, the distinguished observers who have recorded these cases should have failed to appreciate their true nature. Dr. George Johnson states that he has twice seen acute nephritis occur in the course of an attack of rheumatic fever. Bartels, who also describes a case, found that, in all the instances which he observed, recent endocarditis was present, and he leans to the embolic view; but Wagner and Leyden, who also noticed the association of rheumatic nephritis with endocarditis, remark that there is, in many instances, no other evidence of embolism. Dr. Dickinson has recorded a typical case, in which no murmur was heard during life, and in which the cardiac valves were found to be quite healthy *post-mortem*. He is inclined to regard the renal inflammation as standing in the same relation to rheumatic fever as scarlatinal nephritis does to scarlet fever. M. Conderc,

who discussed the question at length in his graduation thesis, added yet another to the list of recorded cases, and argued against the embolic theory, on the grounds that the invasion is not always sudden, and that œdema may precede the appearance of albumen in the urine.

It is a remarkable fact that in almost all the published cases of rheumatic nephritis the pericardium was attacked prior to the appearance of albumen in the urine, so that nephritis must be added to the list of rheumatic lesions which are especially apt to occur in association with pericarditis. This was so in Dr. Dickinson's case, as well as in those recorded by Bartels, Conderc, Tapret, Deroye, and Hayem, to quote only a few of the most convincing examples; as well as in the following case, which was under my father's care in King's College Hospital in 1864.

A youth aged seventeen was admitted on September 29, 1864, suffering from a third attack of rheumatic fever. He had taken cold after a warm bath on the 23rd, and on the 27th the joints became affected. On his admission, the hands, wrists, elbows, knees, and ankles were swollen and painful; he was sweating profusely, and his tongue was coated with a white fur. The pulse-rate was ninety-six, and the respirations thirty-four to the minute; on auscultation of the heart a systolic murmur was heard at the apex. The urine was high-coloured, neutral, and contained no albumen; he was treated with an alkaline quinine mixture. On October 3rd a soft friction sound was heard at the cardiac base, which had almost disappeared by the 6th. The note of October 8th states that there was still some pain in the præcordial area, and that the friction sound was again louder. The urine still contained no albumen. On October 20th the friction rub was still heard. On October 23rd, which was the 24th day after his admission, the urine passed was found to be of a bright red colour, and contained some blood and a large quantity of albumen. On October 27th there was less blood, but still one-quarter of albumen. On the 29th the urine was only slightly smoky, and contained one-third albumen. About this time the sputum became slightly blood-stained, but nothing could be found amiss in the lungs. On November 15th the urine contained only a trace of albumen, and this was still present until the 24th, at which date the notes cease.

The symptoms observed in these cases of rheumatic nephritis resemble those of ordinary acute nephritis; there is usually some general anasarca and conspicuous anæmia; the quantity of albumen is large, and the presence of casts is usually noted. Although

the renal inflammation runs, as a rule, an unusually rapid course and the symptoms quickly clear up, it may, as Professor Leyden has shown, assume a chronic form, the kidneys passing through the various stages of parenchymatous degeneration and interstitial overgrowth that are observed in other forms of chronic parenchymatous nephritis.

Thyroiditis.—Acute inflammation of the thyroid gland is one of the rarest of all the accidents of rheumatism. The earliest known reference to its occurrence is in some remarks made by M. Mollière during a discussion at the Société des Sciences Médicales at Lyons in 1873. In 1885 M. Zouiovitch, who had himself had opportunities of seeing three cases, took this as the subject of his graduation thesis, and compared with his own observations one recorded by Vulpian. In a paper read at the Clinical Society of London in 1887, Dr. Thomas Barlow described a case in which acute thyroiditis was associated with erythema nodosum, and in the discussion which followed, Dr. Angel Money mentioned an instance in which the same lesion occurred in association with arthritis, endocarditis, and erythema nodosum. The following description of acute rheumatic thyroiditis is based upon that given by Zouiovitch. In the course of an attack of rheumatic fever, or a day or two after the disappearance of the articular lesions, the patient is seized with pain in the region of the thyroid gland. This pain, which is acute, is greatly increased by pressure, by any movement of the neck, and especially by the act of swallowing. The head is held in the position of slight flexion, which affords the maximum of ease to the patient. The onset of the pain is attended by exacerbation or renewal of the febrile symptoms, and is rapidly followed by swelling of the thyroid gland, which swelling is usually most marked in the right lobe. The enlargement attains its maximum in a few hours, and then rapidly diminishes. As the swelling subsides the febrile disturbance abates, and the power of swallowing is restored. So rapid is the cycle of events, that the entire process of evolution and resolution of the thyroiditis does not occupy more than forty-eight hours; and in this respect, as also in the benign character of the inflammation, which never goes on to suppuration, this form of thyroiditis agrees with other acute rheumatic lesions. There remains, however, some more permanent increase of the size of the gland, after the inflammatory symptoms have entirely disappeared.

Lymphadenitis.—M. Brissaud has recorded a case in which inflammatory swelling of the lymphatic glands was associated with

rheumatism. The patient was a youth aged seventeen, who had recently suffered from rheumatic fever, with endocarditis and pericarditis, and numerous subcutaneous nodules. Three weeks after his discharge from the hospital the lymphatic glands in the neck, axillæ, and groins, as well as those in other situations, became swollen. There was no evidence of any syphilitic taint, and the enlargement of the glands was not attended with any increase of white corpuscles in the blood. Within three weeks the glands had all returned to their natural size. Brissaud, who regards this as an example of rheumatic lymphadenitis, quotes some somewhat similar cases recorded by Kühn in 1881, but in these cases, of which I have been unable to find the record, the glandular affection does not seem to have had any direct association with an acute rheumatic attack. In a remarkable case of a young girl, reported to the Clinical Society by Dr. Barlow in 1889, enlargement of the superficial lymphatic glands was a conspicuous feature, associated with chronic arthritis of many joints, but in this case the nature of the arthritis was doubtful, although the presence of some nodular swellings along the palmaris longus pointed to rheumatism as its cause.

Affections of the Eye.—The eye is little liable to be attacked in the course of rheumatic fever, but in rare instances conjunctivitis is developed. Mr. Nettleship quotes Dr. Barlow as having more than once met with congestion of the eyes and photophobia in the course of an attack, and M. Besnier speaks of an erythematous or phlectenular conjunctivitis as occasionally occurring. In the thesis of Fernet a very extreme case of this kind is described, in which the conjunctiva was so greatly swollen as to overlap the edges of the cornea. In the third edition of his book Dr. Fuller writes: "Since the publication of the first edition of this work, I have seen reason to doubt whether inflammation of the eye is ever a consequence of true rheumatism. Indeed, the conviction has been forced upon me that, when it occurs during the progress of articular inflammation which is not of a gouty nature, the coincidence is merely accidental, or else that the primary disease is gonorrhœal rheumatism."

The so-called rheumatic iritis, although it cannot be included among the accidents of rheumatic fever, is by no means rare in association with gonorrhœal arthritis, and its occurrence with joint-lesions will always suggest such an origin. Mr. Nettleship, who also holds that iritis is not an event of rheumatic fever, adds that those who suffer from chronic rheumatism are not

infrequently subject to relapsing iritis, and that some of the patients give a history of acute rheumatism as the starting-point of their troubles. This view, which agrees very well with the expressed opinion of the majority of authorities upon diseases of the eye, is supported by the valuable series of cases which Mr. Jonathan Hutchinson has recorded of eye-affections occurring in connection with rheumatism, gout, and gonorrhœal arthritis. By many this form of eye-affection is regarded as an expression of arthritism, the basic diathesis which is supposed to predispose alike to rheumatism, gout, or rheumatoid arthritis. In some instances it would seem that iritis is called rheumatic because its onset is directly attributable to cold, and even when evidence of rheumatic heredity is obtained, the grounds upon which the diagnosis is based are not always very satisfactory. In reply to a series of questions addressed to him by M. Besnier, M. Giraud-Teulon answered: That constitutional rheumatism, apart from articular attacks, is a frequent cause of ocular affections, just as are other diatheses which modify the general nutrition; but that, apart from the family and personal histories of the patients, there is nothing in the nature of these affections which enables one to make a diagnosis of rheumatism. M. Abadie has laid stress upon the good results which he has obtained with salicylate in certain eye-affections which he regarded as of rheumatic origin.

The whole subject seems to require further careful examination, with special reference to the frequency of family or personal histories of true rheumatism among patients who suffer from the so-called rheumatic affections of the eye.

Phlebitis.—Although there are cases on record in which phlebitis was developed in the course of an attack of acute rheumatism, their very rarity serves to emphasise the fact that there is little tendency to affections of the veins in connection with this disease. M. Schmidt collected a series of nine cases from published records, and added eight others to the list, but of the total of seventeen cases, three at least must be regarded as of very doubtful nature. Schmidt arrives at the conclusion that sometimes, but very rarely, the walls of the veins are primarily inflamed in the acute stage of the attack, but that more commonly the inflammation is secondary to thrombosis, and only develops during the stage of convalescence. M. Letulle, who himself records an excellent case of acute phlebitis arising during an attack of rheumatic fever and attended by a conspicuous elevation of temperature, suggests that many conditions favour

the clotting of the blood in this disease, chief among which are the disturbance of the circulation due to cardiac or pulmonary lesions, and the great tendency to fibrin formation. Here, however, Letulle appears to prove too much, since his conclusions only render it the more remarkable that clotting in the veins is so very rarely observed. Letulle found that cardiac lesions were present in nearly all the recorded instances; that among fifteen cases there were eight in which there was pericarditis alone, six with endocarditis, and one with both endo- and pericarditis. In no less than six out of fifteen cases the pleuræ or lungs were also implicated. He arrives at the conclusion that the venous inflammation is the primary, and thrombosis the secondary event.

The distribution of the lesions presents several points of interest. Letulle found that among fifteen cases there were fourteen in which the veins of the lower extremities were involved, in one of which the arms also suffered; in the fifteenth case the veins of the left arm were alone involved. Amongst the cases in which the legs were affected, the veins of the left leg suffered in eleven, those of the right in seven. Dr. Cheadle also mentions thrombosis among the accidents which may occur in the course of rheumatic attacks in childhood, and gives several very interesting examples of its occurrence.

CHAPTER XX.

SCARLATINAL RHEUMATISM.

Arthritis an occasional complication of many specific fevers—The varieties of scarlatinal arthritis—Early and late serous arthritis—Purulent arthritis—Scarlatinal rheumatism—Its association with endocarditis and pericarditis—With chorea—With subcutaneous nodules—With erythema—Scarlatinal rheumatism may be the first of a series of rheumatic attacks—Probably true rheumatism—Theories of the relationship of the two diseases—Rheumatism secondary to measles.

In the writings of Sennert, which were published in the year 1619, attention was called to the occurrence of arthritis as a complication of scarlet fever, and of recent years this form of arthritis has been carefully studied by a number of observers, amongst whom MM. Peter, Sanné, Blondeau, and Drs. Ashby and Johan Bokai, jun., may be specially mentioned. Although at the present day the frequency with which this complication occurs is universally recognised, there are considerable differences of opinion as to its nature—differences which are probably in part due to the occurrence of more than one form of scarlatinal arthritis.

It has been shown that articular lesions may be developed in the course of almost all the specific fevers, and MM. Bourcy and Lapersonne have collected together the knowledge which has been gained upon this subject in valuable monographs. It might easily be supposed, therefore, that scarlatinal arthritis is merely a member of this group of affections,—an actual manifestation of the scarlatinal process, and in no way connected with true rheumatism. It is probable, indeed, that some of the articular lesions are actually of this nature, for Dr. Ashby has described two varieties of serous scarlatinal arthritis, one of which is apt to appear at the end of the first or at the beginning of the second week of the fever, whereas the other is usually observed during the period of desquamation. The earlier form is, according to Ashby, more fixed in its character than the later; varies greatly

in frequency in different epidemics; is seldom attended by endocarditis, and is commonest in the more severe cases, in which the tonsillar inflammation reaches a high degree of intensity. Bokai also distinguishes two kinds of serous arthritis, one of which closely resembles the arthritis of rheumatism, whereas the other runs a more chronic course. Again, there are forms of suppurative arthritis which are observed in connection with scarlet fever, just as abscesses are formed in other situations, and with such purulent joint-lesions, purulent pericarditis, or empyema may be associated. Purulent arthritis is rarer than the serous arthritis of scarlatina, and Ashby states that he has only met with it in three cases. Bokai distinguishes three sub-varieties, which differ in their mode of origin. In some instances the effusion is purulent from the first; in others it is at first serous, but becomes purulent later, and in yet another class of cases the arthritis is purely secondary, being set up by the rupture of a periarticular abscess into the cavity of the joint.

The form of arthritis which has received the name of scarlatinal rheumatism is usually developed during the desquamative period, and is quite as frequently met with in mild as in severe cases. According to Dr. Gresswell, it is commoner in girls than in boys between the ages of ten and fifteen years. When the scarlatinal attack is of an unusually mild character, the patient may first seek medical aid on account of the articular or cardiac symptoms, and under such circumstances the true nature of the case may only be revealed by the presence of desquamation, and from the history of a severe sore throat at the commencement of the attack. A history of sore throat alone has little value in this connection, since throat-affections are common initial symptoms of ordinary rheumatism. It has been stated that the scarlatinal joint-lesions are of a more fixed character than those of true rheumatism, but this is not the case in any marked degree with the arthritis of the desquamative period. The mere fact of the occurrence of arthritis in the course of scarlatina is not in itself sufficient evidence of a rheumatic complication, even although the arthritis so closely resembles the rheumatic form in its clinical features, but it is the association therewith of a series of other rheumatic phenomena that points to its truly rheumatic nature.

Cardiac lesions are much more common in association with scarlatina than with any other infectious disease, and a considerable number of cases of valvular disease are dated from an attack of this malady. Endocarditis and pericarditis occur in cases of scarlatina in which the joints escape entirely, and it is possible

that the scarlatinal poison may be itself an important cause of such lesions; but the absence of articular lesions in such cases by no means precludes their rheumatic origin, for at the period of life at which scarlatina is commonest, rheumatic endocarditis and pericarditis are not infrequently developed without any attendant arthritis.

Again, chorea is a by no means uncommon sequela of scarlatinal rheumatism, as is well illustrated by Dr. Dickinson's statistics of seventy cases of chorea, in four of which the attack followed this affection. In this connection I may quote the case of a girl aged thirteen, who came under my care suffering from a second attack of chorea. Her mother stated that she had had scarlatina six years previously; that during her convalescence she had had dropsy, and also pain and swelling of many joints, the knees being especially affected; and that she had soon afterwards suffered from chorea. At the time when I saw the patient, there were no articular pains, and no subcutaneous nodules; the heart's apex beat within the nipple-line, but there was a loud apical systolic murmur which was well heard at the angle of the left scapula. The patient's father had suffered from rheumatic fever.

Important additional evidence is afforded by the fact that subcutaneous nodules are occasionally developed in connection with scarlatinal rheumatism. Interesting cases of this kind have been placed on record by Dr. Drewitt and Dr. William Stewart. Dr. Stewart's patient was a little boy aged nine, who suffered from scarlatina in June 1880. Three weeks from the commencement of the attack he developed articular rheumatism and subcutaneous nodules, and three months later chorea. At Christmas 1881 he had follicular tonsillitis, and a month later pericarditis with effusion, endocarditis, and pneumonia. With these events a fresh outbreak of nodule-formation was observed, some arthritis, and a skin-affection, which was probably of erythematous nature.

Drs. Ashby, Sanné, and Blondeau have all met with erythema nodosum in direct association with scarlatinal rheumatism, and Ashby has also seen erythema marginatum in the same connection. Lastly, there is, I think, little room for doubt that an attack of scarlatinal rheumatism may be the first of a series of rheumatic attacks. This was apparently the case in the two instances quoted above, and I have seen cases in which the succeeding attacks took the form of acute articular rheumatism. All these considerations point strongly to the conclusion that scarlatinal rheumatism is a true rheumatic affection, and that scarlatina must

be ranked among the more important exciting causes of the disease. It is interesting to note that the patient quoted as an example of scarlatinal chorea was the child of a rheumatic father, a point of some importance, since M. Peter has stated that those who possess a rheumatic tendency are most liable to suffer from rheumatism when attacked by scarlatina. In the present state of our knowledge it is not possible to advance any satisfactory explanation of the so frequent association together of these two disorders, but it must be confessed that the facts appear more easily reconcilable with the constitutional than with the infective nature of rheumatism. Some have suggested that the disturbance of the functions of the skin produced by the exanthem checks the excretion of sweat, and so causes a retention and accumulation of the rheumatic poison in the system; and others, who look upon rheumatism as an infective disease, argue from its association with scarlatina that the micro-organisms of the two maladies are closely related, or even identical—a contention which it is not easy to accept.

Many other forms of secondary rheumatism have been described, some of which will be discussed in the succeeding chapter, but, with one possible exception, none of these can put forward any strong claim to be regarded as true rheumatic affections, from which they differ both in the clinical features of the articular lesions, and the absence of associated visceral lesions similar to those met with in rheumatic cases. There is, however, some reason for believing that rheumatism occasionally appears as a sequela of measles. Dr. Sansom is of opinion that the importance of measles as a predisposing cause of endocarditis has not been sufficiently taken into account, and he is inclined to assign to that fever a share in the production of articular rheumatism also. He has, moreover, recorded a case in which chorea, associated with pericarditis and endocarditis, developed during convalescence from an attack of measles.

CHAPTER XXI.

ON CERTAIN OTHER ARTICULAR AFFECTIONS TO WHICH THE NAME OF SECONDARY RHEUMATISM HAS BEEN INCORRECTLY GIVEN.

Dysenteric arthritis—Variations in frequency in different epidemics—Clinical features—Little evidence of rheumatic origin—Gonorrhœal arthritis—Reflex theory—Arthritis with gonorrhœal ophthalmia—Clinical features—Differences from rheumatism—Endocarditis with gonorrhœa—Nature of the articular fluid—Observations of Petrone, Kammerer, and Haslung—Arthritis with infectious fevers—Example, the arthritis of mumps—Observations of Lannois and Lemoine—The evidence supplied by associated rheumatic manifestations is wanting except in the case of scarlatinal rheumatism.

It has been customary to give the name of rheumatism to a number of forms of arthritis which occur in the course of other and distinct diseases, but which do not readily fall into any other recognised category. That there is good reason to believe in the rheumatic nature of some at least of the articular lesions that are developed in the course of scarlatina, has already been shown; but this conclusion is based, not merely upon the fact that the joints are attacked, but upon the association with the articular lesions of other more distinctly rheumatic manifestations. Of the other so-called secondary rheumatic affections, the arthritis which follows gonorrhœa, and that which is sometimes developed during convalescence from dysentery, are by far the most important, and it is therefore necessary to examine carefully the arguments for and against their inclusion under the head of rheumatism.

Dysenteric Arthritis.—In dysentery arthritis is by no means of rare occurrence, and this fact was recognised as early as the last century. This complication is far more common in some epidemics of dysentery than in others, and consequently the observers who have given the most complete and satisfactory description of its characters are those who have had opportuni-

ties of observing epidemics in which it was especially prevalent. Such an outbreak occurred in the district of Kragerø in Norway, where it was studied by Homan and Hertwig; and another, which occurred at Montarges in 1854, was observed by Huette. It has been stated that members of rheumatic families exhibit no special liability to the development of arthritis when attacked with dysentery, and according to Huette, age, sex, and temperament have little influence upon its occurrence. It is especially in the milder cases that arthritis is apt to occur, and the authors who have described this complication agree that the greatest liability manifests itself, not during the height of the attack, but when the dysenteric symptoms are on the decline, and that it may follow as long as a month after complete recovery.

The onset of the articular inflammation is usually accompanied by some slight degree of febrile disturbance. When a single joint suffers, it is usually one of the knees, but the affection may involve several articulations at once. Pain in the joint, increased by pressure, is usually the earliest symptom noticed, and this is soon followed by swelling due to effusion into the synovial capsule. This swelling occasionally attains to an extraordinary size. The usual termination of dysenteric arthritis is in the complete recovery of the affected joint, but such recovery may be delayed for several months. Suppuration has been observed by M. Thomas, of Tours, and others. As Dr. Rapmund says: "The identity of this form of arthritis with true rheumatism is in the highest degree improbable." The characteristic symptoms of that disease are altogether wanting; there is no profuse sweating, the disturbance of the general health is slight and transitory, and there is no tendency to the involvement of the pericardium or endocardium. It is, moreover, interesting to note that although arthritis was met with in so large a number of cases in the Kragerø epidemic of dysentery, Homan and Hertwig state that true rheumatism is decidedly rare in that part of Norway in which it occurred. It will be granted that the burden of proof lies with those who would claim for dysenteric arthritis a place among true rheumatic affections, rather than with those who maintain that arthritis may occur as a part of many diseases, and that it is quite unnecessary to invoke a latent rheumatic tendency to explain the development of any obscure form of joint-affection.

Gonorrhœal Arthritis.—Of much greater interest to English physicians and surgeons is the arthritis which is associated with purulent urethritis, the so-called gonorrhœal rheumatism. There have never been wanting observers who have held that this is a

variety of true rheumatism, either caused by the gonorrhœal infection, or awakened into activity by its occurrence. That such an awakening does occasionally take place I verily believe, and that some cases of true rheumatism are classed under this head; but, on the other hand, typical gonorrhœal arthritis may be met with in patients who have suffered from rheumatic fever at some previous time. Such patients have told me that the character of the pain in the two diseases is quite different. Some authors, amongst whom is Dr. Ord, whilst they clearly distinguish between gonorrhœal arthritis and true rheumatism, regard the former as urethral rather than gonorrhœal, and attribute the invasion of the joints to a reflex nervous disturbance, having its starting-point in the sensitive mucous membrane of the urethra; but it has been shown that this form of arthritis may originate from the affection of other mucous membranes besides that of the urethra.

M. Poncet, of Cluny, has recorded the case of a man who developed gonorrhœal arthritis upon two separate occasions, after the inoculation of the conjunctiva of one of his eyes for the cure of granular lids, and M. Galezowski and Mr. Clement Lucas have described the development of similar joint-lesions in infants suffering from purulent conjunctivitis. Turning to the clinical features of this form of arthritis, it is found that they differ from those of the arthritis of nervous origin as well as from those of the arthritis of true rheumatism. The constitutional disturbance which accompanies the development of the lesions is slight; the arthritis is of a much more obstinate and intractable character than that of rheumatism, and upon its course the salicylates have little or no influence. Again, the synovial effusion is much greater, and the swelling of the tissues around the joint is much less than is usual in rheumatism, so that in many instances a tolerably safe guess as to the nature of the affection may be ventured from the appearance of the joint alone, before any inquiry is made as to the presence of gonorrhœa.

The question whether endocarditis is ever developed in association with this form of arthritis is one of extreme interest, for the presence or absence of cardiac lesions is perhaps the safest guide which we possess in determining whether or no any arthritis of doubtful origin is or is not rheumatic. Cases are on record in which endocardial lesions have been observed in connection with gonorrhœal arthritis, but these are decidedly rare, and the endocardial lesion is in most of them clearly of the malignant kind. Thirty-two examples of such endocarditis have recently been collected by Dr. Gluzinski, who arrives at the

conclusion that both the arthritis and the cardiac lesions are of septic rather than rheumatic origin; and in one case of this kind which came to an autopsy, Weichselbaum detected the presence of the streptococcus pyogenes in the vegetations on the cardiac valves. Ely has also recently called attention to the occasional association of malignant endocarditis with gonorrhœa. The examination of the fluid obtained by paracentesis of the inflamed joints has yielded some very interesting results in the hands of Petrone and others. Petrone published in 1883 the results of the examination of this fluid in two cases in which the knees were affected. In the first case the gonococcus was detected in the urethral pus, in the blood, and in the synovial fluid; and in the second, the same organisms were found in large numbers in the joint. In the following year Kammerer recorded two similar observations, but whereas he was able to establish the presence of the gonococcus in the articular fluid in a recent case, he failed to detect it in one of longer standing. Dr. Haslung, who examined the fluid in no less than eleven cases, was unable to find the gonococcus in any, but in each instance the fluid was opalescent, of a greenish-yellow colour, thick and glairy, neutral or slightly alkaline in reaction, and contained large numbers of leucocytes. In one case it contained a small quantity of blood. Haslung further states that Professor Studsgaard obtained fluid of like character from the joints of five other patients.

These characters of the articular fluid in cases of gonorrhœal arthritis are in themselves sufficient to differentiate this form of arthritis from that of rheumatism; even if they are not sufficient to show that it is a manifestation of the gonorrhœal process. Lastly, the peculiar distribution of the pains, the greater liability of the temporo-maxillary joints, and the so frequent association with gonorrhœal arthritis of conjunctivitis, and even of iritis, supply other points of difference from true rheumatism.

The Arthritis of Mumps.—Another class of symptomatic arthrites includes those which are developed in connection with the infectious fevers, other than scarlatina, but nothing would be gained from our present point of view by discussing each of these fevers in turn, and I will content myself with taking as an example the joint-affection which has been observed to accompany mumps, and which affords an excellent illustration of the differences which exist between these affections and scarlatinal rheumatism. MM. Lannois and Lemoine, who have carefully studied the pseudo-rheumatism of mumps, are disposed

to think that its apparent rarity is due to its being overlooked in many cases. In this country we certainly have little experience of this accident, and although I have made careful inquiries for articular symptoms in many cases of that disease, I have never found any trace of their presence. According to Lannois and Lemoine, the arthritis is usually developed immediately after the subsidence of the parotid affection at the period when orchitis is liable to occur. The joints of the lower extremities chiefly suffer. In some instances there is merely pain on movement, but in others there is swelling but no redness; and the inflammatory process may involve the tendon-sheaths as well as the joint-structures proper. The arthritis is usually transitory, but relapses may occur. In the cases observed by Lannois and Lemoine, salicylic treatment failed to afford any relief, but, nevertheless, recovery was in every instance rapid and complete. There is no tendency to endocarditis or pericarditis, and but slight constitutional disturbance accompanies the development of the articular lesions; and, like others who have written upon the subject, Lannois and Lemoine regard the arthritis as an actual manifestation of mumps, analogous in nature to the more common orchitis.

I might pass on to the discussion of other articular affections upon which the name of rheumatism or pseudo-rheumatism has been bestowed, such as the articular lesions of hæmophilia, some forms of arthritis of nervous origin, and even secondary pyæmic affections, such as the so-called rheumatism of bronchiectasis; but the examples given are sufficient to show that the mere development of arthritis in the course of a disease which does not, as a rule, implicate the joints, affords little evidence of the occurrence of rheumatism as a complication of the original malady, unless some of the other characteristic lesions of rheumatism are developed in association therewith.

CHAPTER XXII.

CHRONIC ARTICULAR RHEUMATISM.

Chronic articular rheumatism is often a sequela of true rheumatism, but similar lesions may follow other forms of arthritis—Probably a simple chronic arthritis in damaged joints — There are sometimes intercurrent subacute rheumatic attacks — Chronic articular rheumatism dependent on weather and seasons — Distribution of the articular lesions—"Hemi-rhumatisme"—Clinical features—Frequency of rheumatic antecedents—Cardiac lesions, their rarity—Deformities —The "rhumatisme fibreux" of Jaccoud—Observations of Brigidi and Banti on the morbid anatomy of this condition.

A VERY superficial examination suffices to show that in a large proportion of cases the pains which are classed together under the name of chronic rheumatism, or "rheumatics," have nothing whatever in common with true rheumatism; and even if we limit the use of the term to such pains as are obviously situated in the joints, it is by no means easy to determine whether we have to deal with actual rheumatic manifestations, or with simple chronic arthritis resulting from exposure. Such obstinate articular pains are amongst the commonest of the troubles of advancing age, especially in those who, on account of the poverty of their circumstances or the nature of their occupations, are constantly exposed to cold and damp; and it is clearly established that in many instances they are results of an attack of acute rheumatism at some former time; but similar pains are met with in joints which have been the seats of other kinds of acute arthritis; and not infrequently they originate *de novo* in those who have never suffered from any previous articular affection.

Chronic Articular Rheumatism.—During convalescence from rheumatic fever the joints which have suffered during the acute attack often remain painful and somewhat swollen long after the other symptoms have disappeared, and over such residual pains the salicylates, which were effectual in subduing the acute arthritis, appear to have lost all power. We may suppose that,

in such cases, the inflammation of the fibrous structures of the joints has left some damage behind, which lingers on in the chronic form long after the specific process has come to an end; and to similar damage we may probably rightly attribute the origin of chronic articular rheumatism. If this view be correct, chronic articular rheumatism stands to acute rheumatic arthritis in the same relation as the chronic changes in the cardiac structures, which produce the more serious forms of valvular disease, stand to the acute endocarditis in which they originated; or, with Professor Senator, we may compare this affection to a chronic bronchitis, dating from an attack of measles, which, although it originated in a specific inflammation, has no longer a specific character. On the other hand, it is certain that articular pains of a truly rheumatic character may persist over a considerable period, shifting their seats to fresh joints from time to time, and disappearing at length, only to return after some fresh exposure to cold and damp. These considerations have led Dr. Maclagan to distinguish two varieties of chronic articular rheumatism, in one of which the condition of the joints is improved by salicylic treatment, whereas in the other the salicylates have little or no effect. Dr. Maclagan regards the cases of the first group as truly rheumatic; those of the second as examples of local inflammatory changes in the joints. It should be remembered that in those who suffer from the local inflammatory affection, subacute attacks of true articular rheumatism frequently occur, each of which leaves the damaged joints in a worse condition than before.

Chronic articular rheumatism is influenced by the weather and seasons to a far greater extent than is acute or subacute rheumatism, and in many cases it returns with unfailing regularity when autumn sets in, and persists throughout the entire winter. The distribution of the lesions is, as Senator points out, largely determined by local influences; the hands of women much engaged in washing, and the shoulders of cabmen and others who are exposed to repeated wettings, being especially apt to suffer. There is no such symmetry in the arrangement of the lesions, and no such tendency to peripheral distribution, as is observed in rheumatoid arthritis. In forty cases which I tabulated, the distribution of the joint-affection was as follows:—

The knees were affected in			.	.	30 cases.
„ shoulders	„	„	.	.	22 „
„ hands	„	„	.	.	20 „
„ wrists	„	„	.	.	18 „

The elbows were affected in			. .	17 cases.
„ ankles	„	„	. .	16 „
„ feet	„	„	. .	14 „
„ hips	„	„	. .	12 „
„ sterno-clavicular joint was affected in				1 case.

M. Cazalis, of Aix-les-Bains, believes that the joints of one-half of the body are frequently affected alone, and has recorded instances in which this was the case. I have never been able to make out any tendency to such unilateral distribution of the lesions, but Senator has observed it in a few cases in which some definite cause for the special implication of the joints of one side of the body could be made out, such as sleeping in close proximity to a damp wall.

The condition of the joints which are affected with chronic articular rheumatism varies considerably in different cases. In some instances there is nothing objective to be made out, and the pain of which the patient complains is the only indication of the disease. There may be obvious swelling, with local increase of temperature, and with this there may be distinct crackling on movement; or, again, there may be crackling without any swelling. It often happens that, during an exacerbation, a joint, which is usually merely painful, becomes swollen for a time. Synovial crackling, which must be carefully distinguished from the grating of the bony surfaces upon each other, which is so characteristic of rheumatoid arthritis, is one of the most important signs of chronic articular affections. It may be felt when the hand is applied to the moving joint, and may usually be distinctly heard with the stethoscope.

As Senator points out, the morbid appearances in the diseased joints are such as we might expect to meet with as the results of a simple chronic arthritis, namely, thickening of the synovial membrane and cartilage, and in advanced cases, of the joint-capsules and neighbouring structures also.

I have already mentioned that chronic articular rheumatism is specially apt to occur in those who have suffered from acute or subacute rheumatism, and this statement is borne out by the study of the series of forty cases above referred to. Of the forty patients, nine gave clear histories of rheumatic fever in their parents, brothers, or sisters; three others gave family histories of rheumatism and heart-disease; and six of rheumatism only. Sixteen patients had themselves suffered from rheumatic fever, and two others had had chorea. In only eleven cases was there neither family nor personal history of rheumatism or chorea.

Senator remarks that chronic articular rheumatism usually attacks those who have previously suffered from rheumatic fever, but have escaped any serious cardiac mischief, and he finds no evidence of the association with the chronic articular mischief, of active affections of those internal structures which are among the chosen seats of rheumatism. Besnier and other French authors differ from him on this point, in believing that a slowly progressive chronic endocarditis is not uncommon even in the mildest cases. In cases in which there has been an antecedent attack of rheumatic fever it is very probable that Besnier's statement is correct, but there is reason to believe that both the chronic endocarditis and the chronic arthritis are rather secondary than primary rheumatic changes. It is, moreover, by no means common to find cardiac lesions in those who come under treatment for chronic articular rheumatism, even when the history of a previous attack of rheumatic fever is forthcoming; nor is this surprising when we consider that those who escape with their hearts intact are most likely to be exposed to the conditions which favour the development of chronic arthritis, and are most likely to seek relief from so comparatively unimportant a complaint as chronic joint-pains. Of my forty patients, five only had valvular disease, and four of these gave clear histories of rheumatic fever; such histories were also obtained from three of the seven other patients whose heart-sounds were not perfectly normal.

"Rhumatisme Fibreux."—Deformities similar to those which result from rheumatoid arthritis are sometimes developed in the course of simple chronic rheumatism. Ulnar deflexion of an extreme type may result from repeated attacks of rheumatic fever in which the joints of the hands suffer. Fig. 9 represents the hand of a patient who had suffered from a number of acute attacks, in which this deformity is particularly well marked. The fingers could be easily returned to their natural position, but the deflexion was reproduced as soon as they were released. In this case there was neither pain nor crackling to indicate any morbid change in the metacarpo-phalangeal joints, nor was there any enlargement of the articular ends of the bones. The more serious deformities are apparently rendered permanent by the contraction of the fibrous bands which are formed about the diseased joints, but they evidently originate primarily in contracture of the muscles. We owe the earliest description of these extreme cases to M. Jaccoud, who gave to them the name of "*Rhumatisme chronique fibreux.*" In such instances, which are decidedly rare, there is usually well-marked ulnar deflexion of the fingers, and the phalanges of the

fingers and toes are distorted as in extreme cases of rheumatoid arthritis; and, as in that disease, the deformities may be readily reduced in the earlier stages, only to resume their vicious positions when released. In most of the recorded cases the deformities have followed upon repeated attacks of rheumatic fever, and in one described by M. Besnier, although no history of antecedent arthritis was obtained, valvular disease was present.

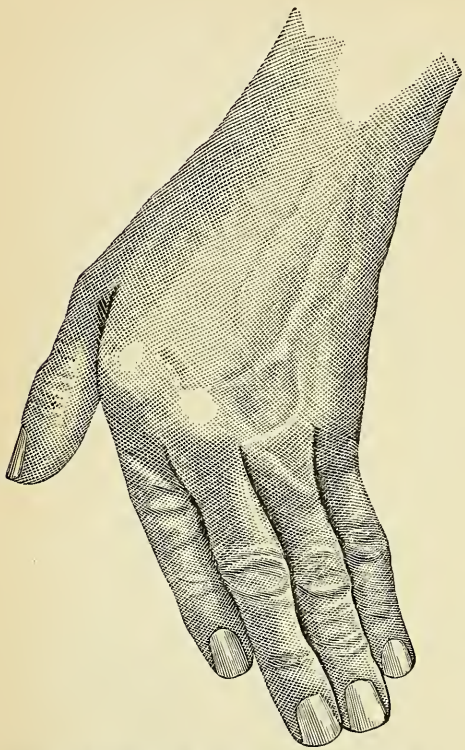


Fig. 9.—Extreme Ulnar Deflexion of the Fingers resulting from repeated attacks of Rheumatic Fever.

The clinical aspects of this condition are well illustrated by the original case recorded by Jaccoud, which was that of a young man aged nineteeen, who had suffered from four attacks of rheumatic fever in which the hands and feet escaped, and a fifth and sixth in which they suffered severely. The deformities began to make their appearance during the third month of the fifth attack, and they could be rectified without difficulty at first. The muscles of all the limbs underwent conspicuous atrophy. The terminal phalanges were extended in a straight line with those of the second row; and those of the second row were hyper-extended upon the first, with the exception of those of the thumbs and little fingers. The first phalanges were flexed upon the metacarpal bones, and the fingers were deflected to the ulnar side. The displacement of the heads of the bones, which amounted in some instances to subluxation, gave to the joints a nodular appearance, but there were no osteophytic outgrowths, such as are developed in rheumatoid arthritis. In the palms of the hands tense fibrous cords could be both felt and seen. In a case recorded by Ringuet, the deformities were most marked in the feet, and the

only change noticeable in the hands was ulnar deflexion of the fingers.

The following case, although its nature was very doubtful, presents many points of resemblance with the recorded examples of chronic fibrous rheumatism, but the patient gave no history of rheumatic fever, nor was the heart involved. A young woman, aged twenty-one, was attacked seven years before she came under observation, with pain and swelling in the joints of the hands. The hips, knees, and shoulders were next attacked. When I saw her, there was no enlargement of any joint, but the movements of many were extremely limited, and the hips were completely fixed. There were well-marked deformities of the hands, the ring and little fingers being slightly flexed at the middle joints, whereas the thumbs and index fingers were hyper-extended. The muscles of the hands were atrophied, and the interosseous grooves were very distinct. The tempero-maxillary joints were somewhat stiff, and in them some grating was felt, which, taken in conjunction with a certain amount of stiffness of the cervical spine, suggested the possibility that the case was one of rheumatoid arthritis. The electrical reactions were everywhere normal; the tendon reflexes, where they could be obtained, excessive. This case also presents a certain likeness to some which have been recently described by Drs. Barlow and Pasteur, in which deformities and rigidity, without osteophyte outgrowth, were developed in children, and also to the cases described by German authors (Schüller and Wagner) under the name of *Arthritis chronica rheumatica ankylopoctica*, in which the effusion into the joints is scanty, and there is a great tendency to the formation of fibrous adhesions and consequent ankylosis. That the deformities of chronic fibrous rheumatism are rendered permanent by changes in and around the joint-capsule was shown by the *post-mortem* examination of a case in which the deformities were particularly well marked. Drs. Brigidi and Banti, who have recorded the case, found the articular cartilages intact, and there were no osteophytic outgrowths around the articular surfaces. Division of the extensor tendons, the movements of which were hampered by fibrous changes in their sheaths, only increased the mobility of the joints to a very slight extent. The capsules were contracted, and had a somewhat wrinkled appearance upon their internal surfaces; they were, moreover, thickened and adherent to the surrounding tissues.

It would seem, then, that the vicious position of the parts, which must be primarily due to muscular contracture, is ultimately

rendered permanent as the result of fibrous changes, helped, no doubt, by a permanent shortening of the muscles such as is met with in advanced cases of rheumatoid arthritis. That the fibrous changes should be alone responsible for the deformity, it is not easy to believe, especially when it is remembered that the parts are readily returned to their normal positions in the earlier stages.

Changes identical in character with those which occur in chronic articular rheumatism may result from attacks of gonorrhæal or dysenteric arthritis, and in the former affection the tendency to stiffening of the joints by fibrous adhesions is especially great. These facts, together with the evidence brought forward earlier, tend to support the view that although truly rheumatic exacerbations may occur in its course, chronic articular rheumatism is a sequela rather than a manifestation of rheumatism; that it is, in a word, a local chronic arthritis, the development or recrudescence of which is greatly favoured by exposure to damp and cold.

CHAPTER XXIII.

THE TREATMENT OF RHEUMATISM.

PART I.—*General Treatment—Older Methods of Treatment.*

General treatment—Diet—Alcohol—Aperients—Drug treatment, &c.—Older plans—Bleeding—Blisters—Cupping along spine—Mercurial drugs—Tartar emetic—Perchloride of iron—Lemon juice—Aconite—Cyanara—Colchicum—Veratrum viride—Guaiacum—Cinchona bark and sulphate of quinine—Potassium nitrate—The alkaline treatment—The quino-alkaline treatment—Chloride of ammonium—Caustic ammonia—Trimethylamine—Manaca—Cyanides.

Rest.—It is always well for a patient suffering from even the most subacute rheumatism to remain in bed, if for no other reason, in order to secure to the heart as much rest as possible. This is of quite as great importance in the abarticular rheumatism of childhood as in the more severe articular form in which the painful condition of the joints compels the patient to lie up. Sir W. Gull and Dr. Sutton insisted strongly upon this in their paper on the natural history of rheumatic fever, and urged that the enforcement of rest should not be deferred until the articular symptoms are well established, because they found that the heart, if it suffered at all, was usually attacked before the patients were admitted to hospital. It is also desirable to keep patients who develop endocardial murmurs as quiet as possible for some time after the acute attack is over. The bed should be protected from draughts as much as possible, for a fresh chill, taken in bed, appears to have an important influence in favouring the development of some of the more serious accidents of the disease. The bed-clothes should be fairly warm, but, at the same time, as light as possible, for their weight may add materially to the sufferings of the patient. On account of the profuse sweating, it is usually best for the patient to lie between blankets or at least upon a blanket.

Diet.—The diet should be of a non-nitrogenous character; milk and farinaceous food may be given freely, but beef-tea and other animal extracts should be avoided as far as possible. In a paper written shortly before the introduction of the salicylic treatment, Dr. Andrew showed that patients kept upon a non-nitrogenous diet, and treated upon the so-called expectant plan, did at least as well as those treated with any drugs then known; but he restricted his recommendation of this plan to cases of young persons, whose powers of nutrition are unbroken, whereas for patients who are in an exhausted condition, or who develop serious cardiac or nervous troubles, he considered it unsuitable.

Turning to the writings of foreign physicians, we find differences of opinion as to the necessity of rigid dieting in rheumatic fever. M. Homolle considers the diet to be a most important element in the treatment of the case. He recommends that the patient should take only bouillons, light soups, or milk, and especially milk. M. Besnier urges that no rules can be laid down for the dietary of rheumatic patients; but he also recommends light soups and milk in the acute stages. Senator, on the other hand, says that the diet need not, as a rule, be so strict as in other highly febrile diseases, and that it is sufficient to forbid heavy food, and to be guided by the appetite of the patient.

It is obvious that, as Besnier says, no strict rule can be laid down, and that a diet which is well borne by a patient suffering from the sthenic variety of the disease may be quite insufficient for another whose illness is more subacute and prolonged. Again, the patients who show signs of cardiac failure, or whose condition is aggravated by long-standing cardiac disease, will require to be specially considered. When convalescence has commenced, the diet may be gradually improved, but it is well to avoid meat for some time, and to make fish the main article of food. This is the more important because the too early use of meat appears to be sometimes instrumental in producing a relapse.

Alcohol is seldom required in the treatment of rheumatic fever, and there is a consensus of opinion that the cases do better without it; but here again no absolute rule can be laid down. Sir Dyce Duckworth has pointed out that in certain suitable cases alcohol, in small quantities, is often of much service. The cases in which he recommends its use are those of an asthenic type, in which the patients become anæmic and

exhausted, and in which the articular pains yield but little to the salicylic treatment; and I have certainly myself seen good results follow the administration of brandy in such cases. When the feebleness of the first sound at the base gives warning of cardiac failure, and when there is serious valvular disease dating from an earlier attack, the use of brandy will also be indicated, but it is seldom necessary to give any large quantities in this disease.

The thirst, which is often intense, especially when the perspiration is profuse, may be relieved with bland drinks of various kinds, such as milk and soda-water, barley-water, or lemonade. Lemonade has been regarded with especial favour since the recommendation of lemon-juice for the treatment of rheumatism.

Aperients.—An aperient should be given at the commencement of the attack, as constipation is the rule, but unnecessary purgation should be avoided as far as possible, as it is the cause of much suffering to the patient when the articular pains are severe.

Drug Treatment, &c.—The history of the various therapeutic measures which have been in turn recommended for the cure or relief of the more acute forms of rheumatism constitutes a most interesting chapter in the history of medicine. Many drugs and therapeutic measures have been brought before the notice of the profession from time to time, as exercising an important controlling influence upon the rheumatic process. Most of these were at first received with a chorus of approval, but how comparatively inert most of them were is shown by the readiness with which they were abandoned in favour of some fresh plan. Some medicines were prescribed upon theoretical grounds, others merely empirically; but until the salicylic compounds were introduced, each and all of them, although held to be of great value by some physicians, were discredited by others, and all are now almost entirely given up in favour of the more recent introduction. Yet some of the older lines of treatment had very considerable merits, and they may often serve as very valuable adjuncts to the salicylates, or may be followed out with great advantage in cases in which these fail, or in which they are contra-indicated. Nor is there any reason to suppose that we have in the salicylates the best drugs which can be obtained for the treatment of acute rheumatism, for the success obtained with certain closely allied compounds suggests that amongst the vast number of members of the aromatic series, to which the researches of chemists are daily making additions, some may be found which will prove

to be even more effectual in curtailing the suffering which attends this disease.

The difficulty of arriving at a just estimate of the value of any particular line of treatment in rheumatic fever is greatly increased by the extremely irregular course of the disease, for in a considerable number of cases rapid recovery takes place without special treatment of any kind. Sir William Gull and Dr. Sutton published statistics of cases treated with mint-water only, and showed that the results were little, if at all, inferior to those obtained under any plan then known; and in 1866 Sir Alfred Garrod wrote that for many years he had followed the so-called expectant plan, and added that in some cases improvement under camphor or coloured water was so striking, that "had not the nature of the treatment been known, great virtue would certainly have been ascribed to it."

Bleeding.—In rheumatic fever, as in almost all diseases, bleeding had in olden times many advocates, and this plan of treatment reached its extreme development in the hands of Bouillaud, but the temporary relief which was often afforded by this proceeding was very dearly bought at the expense of prolonged convalescence, and the great increase of the anæmia, which is under all circumstances one of the most pronounced of the legacies of rheumatism. At the present day this method has been entirely abandoned, and the treatment of rheumatism by repeated bleedings has now merely an historical interest. The extent to which Bouillaud resorted to bleeding is shown by the rules which he laid down for its employment. In the cases of vigorous adults with considerable fever, blood was drawn from the arm at the first visit to the amount of sixteen ounces; on the second day, between fourteen and sixteen ounces were taken morning and evening, and in the interval leeches or wet cups were applied to the joints; on the third day, a fourth bleeding was resorted to in grave cases only, and even on later days if there was pronounced endocarditis or pericarditis. Bouillaud claimed for this method, when adopted in suitable cases, that it reduced the mortality to zero, if resorted to in time; that it prevented the disease becoming chronic; and lastly, that it shortened the attack in severe cases.

Blister Treatment.—The treatment of rheumatic fever by free blistering, which was first employed in France by Dechilly, Lasègue, and others, owes the wide adoption which it at one time met with to the advocacy of Dr. Herbert Davies (in 1864), with whose name this mode of treatment will always be associated.

Dr. Davies ascribed to this method not merely a local action upon the affected joints, but also a constitutional effect, which he attributed to the elimination of the rheumatic poison in the blister serum. He observed a diminution in the force and frequency of the pulse after the blisters had been applied, and at the same time the urine became neutral or alkaline, although no drugs were given beyond an occasional aperient. He claimed also that the risk of cardiac affection was materially diminished. Dr. Davies recommended the application of bands of blistering plaster around the limbs near, but not upon, the inflamed joints. Every joint which was attacked was so treated, and in one case which he records no less than 296½ square inches of blistering plaster were employed. The width of the bands varied between three and five inches. The plasters were carefully applied, and were allowed to remain until a good bleb was produced. Linseed poultices were afterwards applied to aid the flow of serum. After the appearance of Dr. Davies' paper this treatment was extensively employed, and was advocated by Fernet, Fränzel, and others; but Lebert and Senator failed to obtain satisfactory results, and the extensive application of blisters is capable of producing strangury, cystitis, or even hæmaturia. It should be mentioned, however, that in Dr. Davies' recorded cases slight strangury was only once observed.

Dry Cupping over Spine.—The application of dry cups over the spine was recommended by Dr. J. K. Mitchell, who had arrived at the opinion that the disease depended upon spinal lesions. The paper in which he gives his grounds for this belief is one of peculiar interest, because it contains the earliest description of the arthritis which results from spinal injuries and diseases.

Mercurial Drugs.—Amongst the drugs which were largely employed in the treatment of rheumatic fever in earlier times, mercurials, and especially calomel, held a prominent place. With the calomel opium was very commonly combined. The value of the mercurial treatment was thought to be especially great in cases in which the heart was involved, and up to a quite recent date the administration of mercury in such cases was the general rule; so that Sir A. Garrod, who questioned their efficacy, wrote as follows in 1866: "Even at the present day there are comparatively few who would venture to treat the cardiac complication without their aid."

Tartar Emetic was employed by Laennec, Dance, and many others. When administered in large doses, it produces some amelioration of the inflammatory lesions, but in such doses it is

by no means easily borne. Speaking of this drug Dr. Fuller says: "Now, admitting most fully the efficacy of this medicine as an auxiliary to other remedies, I cannot recommend its administration by itself as a remedy for acute rheumatism. Valuable as are its powers in moderating local action, it is insufficient of itself to fulfil the conditions essential to a safe and speedy cure of the disease." Lebert also wrote as follows: "I have often tried this method, and have found tartar emetic as unsafe as it is unpleasant in polyarthritis, since, owing to the painfulness of all movement, repeated vomiting and purging, unless there is complete tolerance, are very troublesome." On the other hand, he recommends the administration of small doses of the drug with nitre, as a very successful treatment in severe cases.

Perchloride of Iron was tried by Dr. Russell Reynolds on account of its valuable influence in checking rapidly-spreading inflammatory processes, such as erysipelas. He found that when this drug was given in doses of ℥xv. to ʒi. every four hours, the temperature usually fell, and the pain disappeared earlier than was, as a rule, the case. Of sixty-five cases which he quotes, in no less a proportion than 36 per cent. the temperature had fallen to normal within five days.

Lemon-Juice was first recommended by Dr. Owen Rees in 1849, and was for a time largely employed. Dr. Rees found it especially valuable in rheumatic fever, in which it appeared to ameliorate the acute symptoms. He administered the fresh juice in doses of ℥i. three times a day. The value of this treatment has been endorsed by several writers, amongst whom Dalrymple and Inman may be mentioned. Lebert also spoke favourably of the action of lemon-juice after an extended trial, and considered that it was equally effectual with large doses of quinine, and had the advantage of causing no unpleasant consequences. Dr. Fuller, on the other hand, found lemon-juice do good in only three out of a series of twenty-nine cases, and ascribed to it the production of depression, griping, and diarrhœa.

Aconite.—In 1834 M. Lombard of Geneva published an account of the treatment of acute rheumatism with an alcoholic extract of aconite, to the mode of preparation of which he attached great importance. Lebert found that the extract prepared in Geneva according to Lombard's directions gave much better results than any which could be obtained in Zurich. This extract was administered in half-grain doses, increased to three or four grains every three hours, without evil effects, and sometimes with good results.

Cyanara.—In 1833 Dr. Copeman of Norwich advocated the claims of the tincture and extract of cyanara—the common artichoke—to the position of specific anti-rheumatic drugs; and again in 1874, after many years' experience of their use, he spoke with undiminished confidence of their efficacy. He was in the habit of prescribing the tincture in doses of thirty minims every four hours, in a mixture containing fifteen grains of potassium bicarbonate, and at the same time gave the extract in the form of pills. He directed that the leaves must be gathered just before the top is fit for food. Béhier, speaking of cyanara, says that it has no therapeutic value, being no more effectual than actea racemosa, which was prescribed by M'Donald in doses of twenty-five to forty minims of the tincture three times a day.

Colchicum.—The extensive employment of colchicum in the treatment of acute rheumatism was doubtless owing to the supposed intimate relationship of rheumatism and gout. It does not appear that the drug has any action in rheumatic cases at all comparable to that which it exerts in gout, and Sir A. Garrod considers that it is useless unless given in such doses as lower the tone of the vascular system, and so afford a temporary ease from pain. He also points out that the action of the drug as a cardiac sedative, even renders its employment dangerous in some cases.

Dr. Fuller, although condemning the employment of colchicum in large doses and alone, regarded it as a very valuable adjunct to other lines of treatment. Trousseau used colchicum largely in the treatment of rheumatism, as also did many English and Continental physicians; but Béhier, writing in 1875, speaks of it as being much less frequently prescribed than formerly, and as no longer having any specific action attributed to it. Lebert spoke highly of a mixture of opium and colchicum, and was in the habit of prescribing a mixture consisting of ʒiii. of tincture of colchicum and ʒss. of tincture of opium in doses of 18–20 minims three or four times daily.

Veratrum Viride.—Like colchicum, veratrum and its alkaloid have had their advocates; but their action is no more satisfactory, and the drawbacks to their use are greater.

Guaiacum.—Neither Dr. Fuller nor M. Béhier formed any high opinion of guaiacum in the treatment of rheumatic fever; but Sir A. Garrod says: "Guaiacum is valuable in subacute cases when the circulation is weak, and the pains are relieved by the application of warmth."

Cinchona Bark and Sulphate of Quinine.—Cinchona bark was

strongly recommended by Haygarth as a most valuable drug in the treatment of rheumatic fever, and he states that Morton, Hulse, and John Fothergill had also employed this drug extensively. Haygarth was in the habit of prescribing the powdered bark in doses of ten to thirty grains every three to eight hours. This practice was followed by Briquet, who gave the sulphate of quinine in large doses in place of the bark. Lebert considered that any action which this drug possesses is due to its quasi-narcotic action upon the nervous system, an effect which is not obtained unless the doses given are sufficiently large to produce deafness and other unpleasant symptoms. Dr. Fuller believed the administration of bark in acute rheumatism to be contrary alike to analogy and experience; but Besnier, writing in 1875, spoke of quinine as the drug most frequently employed at that date in the treatment of rheumatism. He considered that it was not suitable for all cases, and that its beneficial action depended rather upon its action upon the nervous system than upon any true anti-rheumatic property.

Potassium Nitrate.—Nitre is one of the drugs which has been most extensively employed in the treatment of acute rheumatism. It was originally recommended by Brocklesby in 1764, and its use was advocated later by Gendrin, Basham, Bennett, Martin-Solon, and others. Dr. Fuller formed no favourable opinion of this treatment. Lebert found that the drug had a good effect when given in large doses, but that it sometimes caused severe, and even dangerous depression.

Doses varying from a few grains to several drachms were given by different physicians, and Besnier raises his voice in protest against the employment of large doses of this drug, which he considers to be of little value in the treatment of this disease.

The Alkaline Treatment.—The treatment by alkaline drugs, originally introduced by Wright in 1847, was brought into prominent notice by the researches of Fuller and Garrod, and was very generally adopted in this country prior to the introduction of the salicylic compounds. Dr. Fuller attributed the good effects of this treatment, of which he considered that it was impossible to speak too highly, to the restoration of the alkaline condition of the system; the assistance which the alkalies render in maintaining the solubility of the fibrin, and thereby preventing its deposition on the cardiac valves; to their sedative action upon the heart and arteries; and, lastly, to their aiding tissue metamorphosis and increasing the excretion of urine, thereby

aiding the elimination of the *materies morbi*. The alkaline treatment renders the highly acid urine neutral or alkaline, without causing any increase in its quantity; the blood is found to coagulate more slowly, and the frequency of the heart's beats is considerably diminished; but the chief claim of this treatment was that it diminished the liability to cardiac implication, and in support of this claim the statistics of Drs. Dickinson, Senator, Chambers, and others may be quoted, all of which show a considerably smaller proportion of cases with endocarditis and pericarditis among patients treated with alkalies, than amongst those treated by other methods. However open to question are the theoretical grounds upon which this plan of treatment was based, it must be acknowledged that the evidence in favour of its utility is very strong, and cannot be lightly dismissed.

Whether the alkaline carbonates or the salts of the alkali metals with vegetable acids are employed, the treatment is essentially the same, for the latter when taken into the stomach are decomposed, and are represented in the urine by the corresponding carbonates. Dr. Fuller was in the habit of prescribing an effervescing draught of potassium or ammonium citrate, to which from forty to sixty grains of potassium or sodium bicarbonate were added, and such other drugs as were indicated by the condition of the patient. Sir Alfred Garrod employed a dilute solution of potassium bicarbonate in doses of about thirty grains every four hours, until the joint-symptoms and febrile disturbance had completely disappeared. Such doses were not found to give rise to any disturbance of the stomach or other unpleasant symptoms.

The Quino-Alkaline Treatment.—The practice of giving quinine in association with the alkalies was introduced by Sir Alfred Garrod, who directed that sulphate of quinine should be rubbed up with a solution of bicarbonate of potassium, to which some mucilage is afterwards added. In acute cases, in adults, as much as five grains of quinine and thirty grains of the bicarbonate may be given in a dose. Other carbonates or vegetable salts of the alkali-metals may, of course, be substituted if desired. Garrod found that this treatment was far more efficacious than the simple alkaline plan, and it is at present employed by many physicians as an adjunct to the salicylates.

I have myself found this treatment of great value in many cases, and Sir Dyce Duckworth, who has kindly favoured me with an expression of his views as to its value, writes as fol-

lows:—"I have a high opinion of the value of quino-alkaline treatment for many forms of arthritic disorder. I speak from an experience of twenty years of it. I have certainly found it useful in adynamic forms of rheumatic fever, especially with a complication of pericarditis, and when there is a tendency to relapse. When salicylic treatment fails or is undesirable, quino-alkaline dosage is generally effectual."

Chloride of Ammonium.—M. Homolle mentions that a diminution of the pains and febrile disturbance was observed by Deliou de Sauvignac under the use of chloride of ammonium in doses of four or five grammes daily; but I have not been able to find a reference to the original paper of this author.

Caustic Ammonia.—Heller has recommended the administration of caustic ammonia in doses of one minim freely diluted with water, and states that in slight cases its use is almost immediately followed by remission of the articular pains.

Trimethylamine and its Hydrochlorate.—Closely allied chemically to ammonia is the compound trimethylamine, which has been extensively employed in the treatment of acute rheumatism, and apparently with a considerable measure of success. Trimethylamine is a compound ammonia in which each hydrogen atom is replaced by the organic radicle methyl, and, like ammonia, it forms a hydrochlorate, a platino-chloride, and a variety of other salts.

Formula, C_3H_9N. Rational formula, $N(CH_3)_3$ Hydrochlorate, $H(Cl)N(CH_3)_3$

This substance, which was formerly erroneously called propylamine,

Propylamine = $CH_3CH_2CH_2NH_2$

is largely contained in the brine of herrings. It is also present in certain plants and in ergot of rye. It is now commercially prepared from the *vinasses* of the beet-sugar refineries. Commercial "propylamine" is a substance of very uncertain composition, a fact which may account, to some extent, for the very unequal therapeutic effects obtained by different observers. It was first employed in the treatment of rheumatism by a Russian physician, Awenerius, who treated a number of cases with this

drug in the year 1854. Further cases were recorded by Guibert and others, but it does not appear to have received any extensive trial until 1873, when its use was advocated by M. Dujardin-Beaumetz, who had found it to be of great service.

In place of the commercial preparation this physician employed the hydrochlorate of trimethylamine, which has the advantage of being a definite salt, analogous in composition to ammonium chloride.

The investigation was carried on by Peltier, Besnier, and others in France, and by Loewer and Leo in Germany, all of whom spoke highly of its value in the treatment of rheumatism. It is claimed for trimethylamine that it has a marked effect in reducing the articular pains, and in relieving the congestion of the joints; that it reduces the temperature and shortens the attack. In the healthy subject it is found to have the effect of depressing both the pulse and the temperature. Dujardin-Beaumetz administered the hydrochlorate of trimethylamine in doses of from half a gramme to a gramme in the twenty-four hours. As the salt has an irritant action on the mucous membranes, it requires to be freely diluted with water. Trimethylamine may be administered in doses of twenty minims. The smell and taste are disagreeable, recalling those of herring-brine, but this is much less marked in the hydrochlorate, and may be disguised with peppermint-water.

It seems probable that these drugs would have been far more largely employed had not attention been only recalled to them within a year or two of the introduction of the salicylates; but it should be mentioned that Lebert states that in the small number of cases in which he gave trimethylamine it appeared to have no effect whatever in controlling the rheumatic attack.

Manaca, the root of *Francisca uniflora*, has been recommended by some American physicians. Dr. Cauldweel states that it is sometimes useful in the more chronic cases, but in acute cases he obtained little result from its use. Dr. Garland also thought that it did good in some subacute cases, and Dr. Gottheil recommended its use in chronic articular rheumatism. The published results are not very striking. The fluid extract of the root is given in doses of ℥x. or xv. up to a drachm. Dr. Bloodgood found that large doses were apt to cause severe headache, diarrhœa, and bloody stools.

Cyanides.—The cyanides of zinc and potassium were recommended by Luton in 1875. He found that they shortened the duration of the malady, and that they lessened the risk of

visceral lesions—claims which have been made for many drugs—and they have, moreover, an anodyne action. Luton prescribed the cyanide of zinc in quantities of from five to twenty centigrammes in the twenty-four hours, either suspended with mucilage or in the form of a pill, and the cyanide of potassium in pills up to the amount of ten centigrammes in the twenty-four hours. Fifteen centigrammes of the latter salt produced some toxic symptoms.

CHAPTER XXIV.

THE TREATMENT OF RHEUMATISM.

PART II.—*The Modern Treatment of Rheumatism.*

The introduction of the salicylic drugs by Buss, Maclagan, Reiss, and Stricker—The salicylic drugs—The effect of the salicylic treatment upon the temperature—Upon the articular lesions—Does not increase liability to relapse, but recrudescences are frequent if the drug is stopped too soon—Effects of salicylic treatment upon the visceral lesions—Are the salicylic compounds specific anti-rheumatic drugs?—The mode of action of the salicylic drugs—Cases in which they fail—Their toxic effects—The relative advantages of the various drugs—The manner of administering sodium salicylate—Benzoic acid and the benzoates—Phenacetin—Antipyrin.

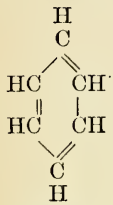
UNQUESTIONABLY the introduction of the salicylic drugs was by far the greatest advance yet made in the treatment of rheumatism, as is testified by their almost universal employment at the present day, and the general consensus of opinion as to their value in suitable cases. Attention was first called to the action of these drugs in rheumatic fever in papers by Buss in Switzerland and Reiss in Germany in the year 1875, and their observations were confirmed by Stricker in 1876. These observers, whilst investigating the effects produced by the administration of salicylic acid in fevers, found that in rheumatic fever they exercised an altogether greater influence than in any other. In 1876 Dr. Maclagan, who had employed salicine in the treatment of rheumatism since 1874, also published the results of his experience with that substance. Unlike the Continental physicians, Dr. Maclagan was led to give salicine by his belief in the malarial nature of rheumatism, on the idea that just as the cinchona is found growing in aguish districts, so the willow, which grows in rheumatic districts, might perhaps yield an antidote to the disease.

Dr. Maclagan reproduces in his book a letter, which he received after the appearance of his paper, from Dr. Ensor of the

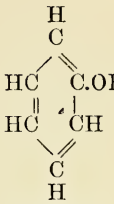
Cape, in which it is stated that an infusion of willow-bark has long been used among the Hottentots in the treatment of rheumatism.

Salicylic acid, $C_6H_4(OH).CO.OH$, is a member of the aromatic group of carbon compounds, being a derivative of benzine.

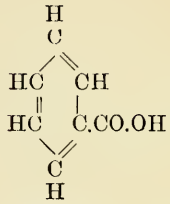
Its relation to this substance is illustrated by the following graphic formulæ :—



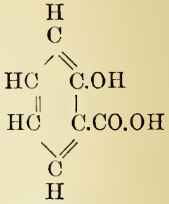
Benzine.



Phenol or Carbolic Acid.



Benzoic Acid.



Salicylic or 1.2 Oxybenzoic Acid.

The drugs derived from salicylic acid which have also been used in the treatment of rheumatism are the following :—

Sodium salicylate, $C_6H_4(OH)CO.ONa$.	Dose, 10–30 grains.
Lithium salicylate, $C_6H_4(OH)CO.OLi$.	Dose, 5–20 grains.
Iron salicylate, $(C_7H_6O_3)_6Fe_2$.	Dose, 3–10 grains in pill.

Oil of wintergreen (*Gualtheria procumbens*), which has been chiefly used in America. Its chief constituent is the methylic ether of salicylic acid, Methyl salicylate, $C_6H_4(OH)CO.OCH_3$. Dose, 10 minims in capsule.

Salicine, a glucoside of salicylic acid, which has the formula $C_{13}H_{18}O_7$. It is obtained from the young bark of the willow and poplar. Dose, 3–20 grains.

Salicylate of quinine, which is given in doses of 2–6 grains, contains about half its weight of quinine, and when the above doses are administered, the quantity of salicylic acid taken is small.

Salol, the phenylic ether of salicylic acid; formula $C_6H_4(OH)CO.OC_6H_5$. This substance is insoluble, and apparently passes unaltered through the stomach, to be broken up by the pancreatic secretion into salicylic and carbolic acids. Dose, 10–20 grains (insoluble in water).

Sodium dithio-salicylate, the most recently introduced member of the group. There are two isomeric compounds of this name, designated as I. and II. Of these, II. only has been employed. The formula of both is—

$$\begin{matrix} S{-}C_6H_3(OH)CO.ONa. \\ | \\ S{-}C_6H_3(OH)CO.ONa. \end{matrix}$$

Dose, 3 grains three times daily.

The statistical method has been very largely employed in the study of the effects of salicylic treatment. A large series of cases so treated have been collected by many observers, and the average length of the patients' stay in hospital, and the proportion with cardiac and other visceral affections, have been compared with those of like series of cases treated according to other methods. The conclusions of the various observers show for the most part a very close agreement, which is the more remarkable when we take into consideration the different manners of administering the drugs, the differences in the duration of the disease before the patients come under treatment, and in the ages and conditions of the patients themselves. An important discussion upon this subject was opened by Dr. Hilton Fagge, at the Medical Society, in the year 1881, and a similar discussion, opened by Dr. Bristowe, was held in the Medical Section of the British Medical Association in 1885, and in these many physicians of eminence took part. To the records of these discussions, and to the valuable paper by Dr. Donald Hood, which is based upon an enormous mass of statistics, I would refer my readers, and will content myself with giving the conclusions which may be drawn from a study of them.

The Effect of Salicylic Treatment upon the Temperature.—One of the most remarkable results of the administration of salicine or the salicylates in acute rheumatism is the reduction of fever which they cause. The salicylates have an antipyretic action in all febrile disorders, but in rheumatism their action is altogether more striking than in other febrile diseases. It may, indeed, be said that the universal use of these drugs has abolished the natural temperature chart of acute rheumatism.

When salicine or the salicylates are given in sufficient quantities, the temperature usually falls to the normal or below it within the space of two, three, or at most five days, and continues to be depressed during the whole time that the administration is continued. As to their potency in this respect, all observers, both on the Continent and in this country, are agreed. When the duration of the febrile disturbance under salicylates is statistically compared with that under other plans of treatment, it is found to be considerably less.

Effect of Salicylic Treatment upon the Articular Lesions.—Simultaneous with, or following closely upon, the reduction of the temperature by salicylic treatment is the disappearance of articular swelling and pain, and a consequent relief of the patient's sufferings. This cessation of pain is also, in favourable cases,

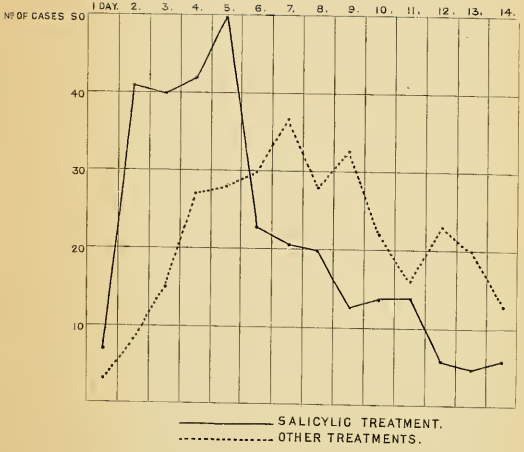
complete within three or four days, and no fresh joints are involved. If, however, the administration of the drug be too soon discontinued, the temperature usually again rises, and the articular symptoms return.

Dr. Donald Hood found that of 728 patients with rheumatic fever treated with salicylate, no less than 582, or 79.9 per cent., lost their pains within seven days; whereas of 612 patients treated on other principles, only 140, or 22.7 per cent., were free from pain within the same period.

The comparative value of the salicylic and other forms of treatment in relieving the articular pains and reducing the temperature in rheumatic fever is clearly shown in Chart VI. The curves are constructed from the statistics of a series of cases, 302 in number, treated by salicylate of sodium, which are given in the late Dr. Hilton Fagge's paper (*Med. Soc. Proc.*, vol. vi. p. 54), and from those of Sir W. Gull's and Dr. Sutton's cases, treated with mint-water; from Sir A. Garrod's cases, treated with potassium bicarbonate; Dr. Davies' cases, treated with free blistering, and Dr. Donald Hood's cases, treated without salicylate. The cases treated without salicylates number 303 in all. The vertical lines represent the number of cases; the horizontal lines the number of days which elapsed (up to fourteen) before the cessation of pain and the fall of temperature to normal. It will be seen that the symptoms subsided after one day of treatment in forty-one of the cases treated with salicylate, and in only eight of those treated by other methods; and that in the great majority of the cases treated by salicylate the symptoms had subsided after five days of treatment. In a certain number of cases treated upon all plans, the symptoms continued longer than fourteen days, but these are not represented in the chart.

It has frequently been stated that the salicylic treatment increases the liability to relapses; but it is probable that, as has been suggested, the apparent relapses are in many instances mere recrudescences of the symptoms, resulting from the too rapid cessation of treatment, or from the want of sufficient care, on the part of the patients, to avoid any exposure or exertion after a rapid and easy recovery. True relapses will sometimes occur under any line of treatment, and they are not, apparently, unusually frequent in cases treated with salicylates. However, Dr. Donald Hood found that among 850 cases treated without salicylates, relapses occurred in thirty-four, or 4 per cent., whereas of 1250 cases treated with salicylates, 182, or 14.6 per cent., relapsed. In these figures only actual returns of fever and arti-

CHART VI.


1 DAY. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14.
Nº OF CASES 50
40
30
20
10
SALICYLIC TREATMENT.
OTHER TREATMENTS.

cular pains lasting more than twenty-four hours were included as relapses. Dr. Hilton Fagge met with 93 relapses among 355 cases treated with salicylate, a proportion of 26.2 per cent. The tendency to recrudescence when the treatment is prematurely stopped supports the view, which has been put forward by M. Homolle and others, that the disease runs its course although all its external manifestations are suppressed,—in a word, that the salicylic treatment controls but does not arrest the rheumatic process.

The Effect of Salicylic Treatment upon the Visceral Lesions.—A study of the evidence which is available leads to the conclusion that the salicylates, although they have such a remarkable power of controlling the arthritis of rheumatism, have no influence which is at all comparable in diminishing the liability to cardiac lesions, or in arresting them when they are once developed.

The final decision of this question is rendered difficult by the great variations in the frequency of cardiac troubles at different periods, which deprives results obtained from the comparison of the proportions obtained in different years of much of their value. There are, however, some observers who hold an altogether different opinion, and maintain that the salicylates have an equal power over the visceral and articular manifestations. Among these is Professor Senator, who quotes the statistics of Brown and von Ibell in support of his contention. Professor Senator acknowledges that the power of the drugs is limited to the warding off of cardiac affections, and that they have little or no influence upon them when they are once developed.

At the conclusion of the discussion of the Medical Society in 1881, Dr. Broadbent expressed a hope that it would be shown that when the salicylates are brought to bear during the early days of the fever, they tend to check the development of cardiac mischief, but he confirmed the opinion that when endocarditis and pericarditis are once developed, the salicylates have no power over them. In the course of the same debate, Dr. Gilbart Smith brought forward statistics which showed a somewhat higher proportion of cardiac implication among patients treated with salicylates than amongst those treated on other plans; and Dr. Donald Hood was unable to trace any decrease in cases treated by salicylates. For reasons already stated, it is not yet possible to be sure whether or no the diminution of the frequency of pericarditis of late years, to which Dr. Church has called attention, and the corresponding rarity of hyperpyrexia, is due to a change in the character of the disease itself, or to the change which has

taken place in its treatment. Possibly it will be found that the lesions of the hyperæmic group are more amenable to salicylic treatment than those of the fibrous class, and that on this account, whilst endocarditis is uncontrolled thereby, there is a diminution of acute pericarditis, corresponding to the alleviation of the arthritis, of which I have spoken as a lesion of the erythematous or hyperæmic kind.

The salicylates have been extensively employed in the treatment of a variety of abarticular rheumatic manifestations, and in some, such as the rare condition described as acute rheumatic thyroiditis, its efficacy has been confidently asserted, so that, on the Continent especially, the influence of these drugs upon any particular lesion is held by many to afford a test of its rheumatic or other origin.

Are the Salicylic Compounds Specific Anti-Rheumatic Drugs?—The above considerations lead naturally to the question whether or no we have in the salicylic compounds the actual specific drugs for true rheumatism. That this is the case is held by Drs. Bristowe, Maclagan, Senator, and many other eminent observers. The chief objection to this view is, that if the salicylates are specific against rheumatism, and actually control the morbid process itself, they should be capable of controlling all its manifestations, and should affect the heart as well as the joints; whereas all the evidence which we possess tends to show that their influences upon the cardiac and articular lesions are by no means comparable.

It is not necessary that a specific drug should actually destroy the disease, for quinine, although it represses an attack of ague, does not always prevent a return, although the patient may have removed in the interval to a non-malarious region; and the inability of mercury and iodide of potassium to cure the disease syphilis, in spite of their remarkable action upon its outward manifestations, has been strongly maintained by no less an authority than Dr. Gowers.

That the salicylates have a repressant rather than a curative action in rheumatic fever, I have already endeavoured to show from the ready occurrence of recrudescences when the drugs are too quickly discontinued; and further evidence is afforded both by the development of cardiac lesions while the patient is fully under their influence, his temperature normal, and his articular symptoms nil, and by the occasional rapid rise of the temperature to hyperpyrexial limits under the same circumstances, such rise being uncontrolled by the treatment. That the salicylates

do not succeed in every case is not opposed to the specific view, for other specific drugs, such as colchicum and quinine, sometimes fail in the diseases for which they are regarded as the peculiar remedies. An alternative supposition is that the salicylic drugs have a special action upon the articular structures, and that upon this fact their potency depends, the temperature falling as the arthritis subsides. In favour of this view is the fact, which can hardly, I think, be questioned, that articular pains, of other than rheumatic origin, are to some extent relieved by this treatment; but its action in non-rheumatic cases is in no way comparable to that which it exerts in true rheumatism; and if the salicylates are not specifics for rheumatism, it is beyond question that they exert a specific influence upon rheumatic arthritis.

The Mode of Action of the Salicylic Drugs.—Several explanations have been advanced of the mode in which the salicylates act in rheumatic cases. Dr. Maclagan holds that their action is an anti-rheumatic rather than an anti-pyretic one, because the fall of temperature is attendant upon the removal of the local symptoms. He believes that the salicylic drugs cure rheumatism because they destroy the micro-organisms which are the primary cause of the disease. In this connection it is interesting to note that several of the drugs which have been most extensively employed in the treatment of rheumatism belong to the antiseptic class, and it has recently been proposed to employ trimethylamine for the disinfection of sewage. Dr. Latham, on the other hand, attributes the action of these drugs to the power possessed by salicylic acid of checking the formation both of uric and lactic acid in the system, which two substances he regards as respectively the primary and secondary poisons of rheumatism; whereas Dr. Haig is inclined to attribute it to the power which he has shown the salicylates to possess of causing a great increase in the amount of uric acid excreted by the kidneys. Others again have ascribed their efficacy to some action upon the nervous system; and M. Vulpian attributes it to a direct action of these salts upon the anatomical elements of the articular structures.

Cases in which the Salicylates Fail.—In spite of the good results which generally follow the employment of the salicylic treatment, there are some instances in which these drugs fail to give any appreciable relief, in what are apparently cases of true rheumatism. In the present state of our knowledge it is not possible to discriminate such cases beforehand.

In the Report of the Collective Investigation Committee of the British Medical Association on acute rheumatism, a number of cases of this kind are mentioned occurring in patients of all ages, but they only reach 4.1 per cent. of the total number treated with salicylates. Dr. Whipham points out that in most of these cases the dose given was unduly small, or was not administered sufficiently often to ensure success. It is possible that the apparent failure is in some instances due to an error of diagnosis; gonorrhœal arthritis, or even the more acute form of rheumatoid arthritis, being mistaken for true rheumatism. There remains a residue of cases of an undoubtedly rheumatic character, in which the treatment is unsuccessful, although ample quantities of the drugs are given. The patients have often passed the age when rheumatic fever is most common, and the disease has usually an asthenic character. Good results may follow the adoption of the quino-alkaline treatment, and, as Sir Dyce Duckworth has pointed out, the administration of small quantities of brandy is sometimes most beneficial.

The Toxic Effects of the Salicylates.—Dr. Greenhow was the first to call attention to certain evil effects which may follow the administration of the salicylates, but further experience has shown that these are rarely sufficiently serious to interfere with their use. These toxic effects may be arranged in five classes, viz.: (1.) Gastric disturbance; (2.) Cardiac failure; (3.) Cerebral symptoms; (4.) Renal troubles; and (5.) Hæmorrhages. The slightest and most frequent toxic effects, which usually go by the name of salicism, are deafness and buzzing in the ears. These symptoms are often observed, even in the most favourable cases, and rapidly disappear when the amount of the dose or the frequency of its exhibition is diminished. Headache is sometimes noticed, and the patient may even become delirious; and this latter symptom is of importance, because delirium is the commonest of the earlier symptoms of attacks of cerebral rheumatism with hyperpyrexia. Cardiac failure is occasionally noted, and I have myself seen cases in which the weakness of the pulse and the failure of the first sound was apparently due to this cause. Dr. Greenhow observed such cardiac failure in several cases, but it must be remembered that like symptoms are noticed when myocarditis is developed, and they may, therefore, be independent of the treatment, or only increased by the employment of the salicylates. Gastric disturbance and vomiting may follow the administration of the salicylates, and such troubles were especially common in the early days of the treatment, when the free acid was extensively employed.

Albuminuria or hæmaturia have been observed by Millican, Lürmann, Lecorché, and Telamon, and G. Müller; but here again it must be remembered that albuminuria, and even nephritis, may occur in the course of attacks of rheumatic fever treated upon any plan. Dr. L. Shaw has particularly called attention to the occurrence of hæmorrhages in patients undergoing salicylic treatment. Epistaxis has been noticed by many observers. Shaw records three cases which occurred in Guy's Hospital, in one of which there was epistaxis and an extensive retinal hæmorrhage accompanying salicylic delirium; in one hæmaturia, with ecchymosis of the pelves of the kidneys and the bladder, and delirium; and in the third similar ecchymosis of the kidneys in enteric fever treated with salicylate.

He gives the following analysis of the toxic effects observed in 174 cases treated with salicylates in Guy's Hospital in the years 1881 and 1886:—

	1881.	1886.
No toxic effects mentioned	40	23
Total with toxic symptoms	62	49
Delirium	21	12
Deafness	33	28
Vomiting	15	17
Tinnitus	16	13
Headache	12	21
Epistaxis	6	5
Irregular or slow pulse	4	9
Albuminuria	4	2
Hæmaturia	1	1
Retinal hæmorrhage	1	0
Urticaria[1]	1	0

The Relative Advantages of the Various Drugs.—As to the relative value of the various salicylic drugs, different opinions are held, but, in the matter of drugs, there is usually a survival of the fittest, and hence it may be concluded that sodium salicylate, which is by far the most widely used, is as efficient as any, and that any special ill effects it may produce are no bar to its employment; although it is probable that its cheapness has some share in determining its popularity. Some physicians hold that the natural sodium salicylate, which is prepared from oil of wintergreen, should alone be given, and Dr. Latham insists strongly upon this. Dr. K. Fowler, after extensively employing both the natural and the artificial salt made from carbolic acid, expresses the opinion that toxic effects are less frequently observed when

[1] The small number of cases with albuminuria and urticaria might well have been observed under any form of treatment.

the former is given, and he claims for this vegetable product that it causes neither vomiting nor delirium. In thirty-nine cases so treated toxic symptoms were developed in ten only, and these were chiefly deafness and buzzing in the ears. The comparative frequency of toxic symptoms when the commercial sodium salicylate is used suggests that some of these may be due to impurities in the drug, but the deafness and tinnitus must certainly be true salicylic symptoms, since they are observed even when the oil of wintergreen is itself administered.

Professor Charteris and Mr. Maclennan have carried out an experimental research as to the comparative action of the natural and artificial salicylates, and come to the conclusion that the artificial salicylic acid contains an impurity or impurities which may account for the restlessness, confusion, and delirium sometimes attendant upon its use, as well as for the retarded convalescence and prostration observed in some cases. The action of the impurity which was isolated by Mr. G. G. Henderson seems to be that of a slow and certain poison, the lethal dose of which is relatively much less than that of salicylic acid. The lethal dose for a rabbit weighing a pound was found to be about one grain.

Salicylic acid, which was at first extensively employed, was soon given up on account of the gastric disturbance which it is so apt to cause, and has now been entirely superseded by its sodium salt. Salicine has the great advantage of being a tonic rather than a depressant drug; Dr. Maclagan claims for it equal power with the salicylate of sodium in combating rheumatism, and it may be substituted with advantage when the sodium salt is not well borne. Dr. Cheadle specially recommends salicine for the treatment of rheumatism in children. Salicylate of quinine has never been very extensively employed, as the amount of salicylic acid which can be given in this form is small. Salol has the disadvantage of being an insoluble compound, and it also has the disadvantage of producing carboluria, which property some consider to be no serious drawback to its use. It has been stated to have more active anti-rheumatic properties than sodium salicylate, but it has not been successful in superseding that substance. Dr. Bradford, after describing a series of cases under Dr. Ringer's case which were treated with salol, concludes that it has no advantage over the salicylate of sodium, and that although it rapidly reducer the temperature, it is less efficacious in relieving the pains. Dr. Dindenborn speaks very highly of the efficacy of sodium dithiosalicylate II., for which he claims a more powerful action than sodium salicylate, and, as it is given in much smaller doses, it

does not, according to this observer, give rise to gastric disturbance, tinnitus, or depression of the circulation.

The Manner of Administering Sodium Salicylate.—Sodium salicylate is usually given to adults in doses of twenty grains every four to six hours at first, the second dose being given two hours after the first. When the temperature falls and the articular pains are relieved, the frequency or amount of the dose may be diminished, but the drug should be given in gradually decreasing quantities for some time after the disappearance of the symptoms.[1] In subacute cases less will be required, and if the full doses are given at first, they may be more rapidly reduced. Some physicians are in the habit of giving an alkali with the salicylate, and Dr. Isambard Owen was inclined to attribute to the adoption of this plan some share of the credit for the comparatively small proportion of cardiac implication which he found among the cases treated in St. George's Hospital which he tabulated. Some recommend that the drug should be discontinued if pericarditis or endocarditis is developed, but this is not necessary, at least in the less severe cases. When, however, signs of cardiac failure, whether due to the drug or to myocarditis, are observed, the salicylate treatment should be given up; stimulants should be administered in most cases, and the quino-alkaline treatment substituted. When the salicylate fails to give any relief after a fair trial, it is useless, or even harmful, to continue its administration for any length of time, and some other plan of treatment should be adopted. The mere occurrence of deafness or buzzing in the ears does not demand the discontinuance of the drug, but the onset of delirium, or other more grave toxic symptoms, does so. In some such cases it is advisable to substitute salicine for the sodium salt.

Benzoic Acid and the Benzoates, which are so closely allied chemically to the salicylates, have been recommended by Professor Senator and others. Senator administered the acid in doses of 4–10 grammes to patients suffering from rheumatic fever, with good effect, and found that it sometimes proved useful when salicylates failed. MacEwen also obtained good results with sodium benzoate, and thought that in the cases so treated the convalescence was more rapid than is usually the case when the salicylate is given. The sodium benzoate produced no disturbance of the stomach, and gave rise to none of the disagreeable symptoms which are so often developed under salicylic treatment. MacEwen prescribed this drug in doses of 15–20 grains every

[1] Some physicians give the doses at shorter intervals at the commencement of the illness, others give only fifteen grains for the dose.

two or three hours, and continued to administer the same amounts with diminished frequency after the articular symptoms had disappeared.

Phenacetin or Para-Acetphenetidin,

Formula, $C_6H_4 \begin{cases} O.C_2H_5. \\ NH(CO—CH_3). \end{cases}$ Dose, 8–12 grains,

has been successfully employed by Drs. Mahnert, Cattani, and others in the treatment of acute rheumatism.

Antipyrin, or di-methyl-oxy-chinicine, $C_{10}H_{12}N_2O$, was first used as an anti-rheumatic drug by Lenharz, Alexander, and Demme in 1884, and by Pusinelli in 1885. Its action apparently closely resembles that of the salicylic compounds, leading quickly to a diminution of the articular pains and a disappearance of the swelling of the joints, as well as to a reduction of the fever. Clément has seen good results from antipyrin in cases in which the salicylates have failed; but Neumann states that there are cases in which both are useless, and that when salicylate fails, antipyrin usually fails also. The chief advantage claimed for antipyrin over the salicylic drugs is the absence of any tendency to cause deafness, giddiness, or singing in the ears, as the salicylates do; but antipyrin produces equally unpleasant symptoms in some persons, among which are erythematous rashes, which must not be confused with the rheumatic erythemata. The quantity of antipyrin given in rheumatic fever varies between 4 and 10 grammes (℥i. and ℥iiss.) in the twenty-four hours, and Gobeliewski has obtained the best results with the larger doses.

CHAPTER XXV.

THE TREATMENT OF RHEUMATISM.

PART III.—*The Treatment of Certain Special Accidents and Sequelæ.*

Pericarditis—Blister, &c.—Paracentesis pericardii—Endocarditis—Pneumonia—Tonsillitis—Hyperpyrexia—Baths—Mode of administration—Visceral lesions do not contra-indicate baths—Statistics of treatment by baths—Ice-pack—Arthritis—Special treatment now seldom needed—Absolute rest to parts—Electricity—Injection of carbolic acid—Injection of pure water—Blister for residual pains—Passive movement for stiffness—Chronic articular rheumatism—Prophylaxis—Drugs—Mineral waters and baths—Thermal treatment of the articular sequelæ of rheumatism—Of cardiac lesions—Of the rheumatic state.

IN addition to treatment which is directed against the general condition of the patient, certain of the accidents which arise in the course of rheumatic fever require special treatment. Of these the most important are inflammation of the pericardium and cerebral symptoms with hyperpyrexia.

Pericarditis.—When a pericardial friction-sound is developed in the course of an attack of rheumatic fever, it is well to apply a blister over the upper portion of the præcordial area. This treatment has been objected to on the ground that the presence of the blister interferes with further auscultation, but, if the blistered surface be not too extensive, any spread of the inflammation may be recognised without difficulty. When the præcordial pain is severe, great relief is afforded by the application of a few leeches or of a mustard poultice. In the great majority of cases no further treatment specially directed against the pericardial inflammation is required; but when there is copious effusion into the sac, it may be necessary to resort to the operation of paracentesis.

The difficulty and danger of this operation lies in the risk of wounding the heart itself; but even such an accident is not neces-

sarily fatal. The operation may be performed in several ways, either by direct puncture, by incision of the superficial tissues and final puncture, or by simple incision. The aspirator-needle is now usually employed for this purpose. In choosing the seat of puncture, the anatomical relations of the pleura to the pericardium, the position of the heart, and the position of the internal mammary artery must be borne in mind. The risk of piercing the pleura must be faced, for it approaches so near to the edge of the sternum that there is little chance of its escape, whatever be the position chosen. In order to avoid the internal mammary artery, it is necessary to keep very close to the edge of the sternum, or else to keep well away from that bone. The fourth or fifth left intercostal space is usually selected. Dr. Samuel West specially recommends the fourth; and Mr. Parker, who has made numerous *post-mortem* experiments upon this point, recommends the fourth left interspace close to the sternum. Mr. Godlee recommends that the needle should be directed obliquely upwards and outwards, in order to minimise the risk of wounding the heart. In some instances the operation has been performed to the right of the sternum; and Dr. Dickinson, in recording a case, advised that, when this situation is indicated, the puncture should be made in the fourth or fifth interspace, close to the sternum. The reason for selecting the right side of the sternum in his case was, that the left pleura being also affected, the heart moved considerably, according to the state of the pleura, and the opening was made to the right, at a time when the heart was carried over to the left side, after the removal of the pleuritic fluid. It will be seen from this, as well as from other recorded cases, that the seat of puncture must be to a certain extent determined by the nature of the particular case, and not by any hard and fast rule. Some physicians stop the administration of the salicylates when any cardiac inflammation declares itself, and others recommend the substitution of the less depressing salicine for salicylate of sodium.

Endocarditis.—At the present day the onset of endocarditis is not usually held to indicate the necessity of any special treatment, but in former times it was the regular practice to give mercury when the signs of this affection were developed; and writing in 1866, Sir Alfred Garrod said that there were at that time few physicians who would venture to treat a case without that drug. The only treatment which appears to have any marked effect upon the course of endocardial inflammation is the enforcement of rest; and when endocarditis is present, as complete

rest as possible should be enjoined for a considerable period, in order to afford the best chance of recovery of the affected parts without serious and permanent damage of the valve structures. There is also some reason for believing that the alkaline treatment is not altogether ineffectual in preventing endocarditis.

Pneumonia.—Dr. Cheadle recommends that when pneumonia is present salicine should be substituted for salicylic acid, or better still, that quinine should be given in full doses, combined with citrate of potassium.

Sore Throat.—As a rule, no treatment is required for the initial sore throat of rheumatic fever. Many physicians hold that the salicylic treatment has a most potent action upon tonsillitis, especially of the rheumatic variety.

Hyperpyrexia.—Of all the accidents of rheumatic fever, that which calls for the most prompt and energetic special treatment is the acute cerebral disturbance which is attended by hyperpyrexia. Soon after the discovery of the hyperpyrexia the treatment by external application of cold was tried by Meding in 1870, and by Wilson Fox in 1871; and although, at an earlier period, such treatment had been employed in cases of cerebral rheumatism by Türck and others, it was owing to the papers of Meding and Fox that it became at all generally adopted. Of the various methods of applying cold, that by baths is apparently the most effectual. The bath, which should hold a considerable volume of water, should have at first a temperature of about 90° F., and into it the patient should be lowered in a sheet. During the immersion the temperature of the bath should be gradually lowered by the addition of cold water or lumps of ice, until a temperature of 60–70° F. is obtained. The time of immersion must depend to a great extent upon the way in which the patient bears the treatment, and, if possible, he should be allowed to remain in the bath until the body temperature comes down to about 101° or 102° F. It is by no means desirable to wait until the normal is reached, as after removal the temperature usually continues to fall somewhat. To effect the desired reduction, very different periods are required in different cases, and the immersion may vary from a quarter of an hour to an hour and a half, or even longer. The statistics of the Committee of the Clinical Society on hyperpyrexia show that the time required is independent of the height of the initial temperature and of the reduction of the heat of the water, and cannot be predicted with any approach to accuracy in any given case. On removal from the bath, the patient is dried and

wrapped in blankets on his return to bed, and brandy together with some liquid nourishment should be administered. In some instances a single bath is sufficient to put a stop, once and for all, to the tendency to hyperpyrexia, but this is by no means always the case; and if the temperature shows a tendency to a renewed rise, the treatment must be repeated. In two cases contained in the tables of the Committee above mentioned, the patients ultimately recovered, although it was necessary to administer no less than twenty-six baths.

The presence of cardiac or pulmonary inflammation does not contra-indicate the employment of baths, and the condition is in itself so desperate that the employment of any means which offers a hope of saving life is justifiable, even if it were shown that it was apt to cause an increase of the visceral troubles. It often happens that a patient who is delirious, or even unconscious, at the time of immersion, recovers consciousness in the bath as the temperature falls, and the improvement in the mental condition is attended by a corresponding improvement of the pulse. The chief obstacle which is encountered to the carrying out of this treatment is the opposition of the patient's friends, to whom the adoption of such heroic means appears, not unnaturally, to be cruel or even unjustifiable, and the physician must point out to them clearly the desperate nature of the case, and the fact that the treatment affords practically the only chance of saving the patient's life. The conclusions arrived at by the Committee of the Clinical Society enable him to speak with greater confidence upon this question, for their statistics show that whereas the condition, if left to itself, is almost if not quite certainly fatal if the temperature has risen to a phenomenal height, they further show that among the cases treated by cold there is a very fair proportion of recoveries; and to this last fact further testimony is borne by the isolated cases which are placed on record from time to time. Taking the series of cases as a whole, it was found that

Of 46 bathed cases, 24 recovered and 22 died.
Of 21 unbathed cases, 10 recovered and 11 died.

But in many of the cases of the former class the treatment was only tried as a last resort, when the temperature was already phenomenally high, and when regard was had to the body-temperature at the time of bathing, the advantages of the treatment became apparent; for of the unbathed patients only one in which the maximum temperature exceeded 106° recovered, and in these

cases the average maximum was 105.5°. On the other hand, of the patients who were bathed, no less than fifteen, in whom the temperature of 106° was exceeded, recovered, the average maximum being 106.4°.

Taking all the fatal cases together, the average maximum in the unbathed was 107°; in the bathed, 108.2°. Moreover, there are cases on record in which the treatment has been successful although the maximum temperature has exceeded 110°. The statistics quoted also supply information on another very important point, namely, at what temperature bathing should be resorted to. The conclusion arrived at was that the temperature could not safely be allowed to rise beyond 105°, for it was found that among the untreated cases some were fatal in which 106° was never reached, whereas there was only one of the fatal cases which were treated in which the maximum was below 105°.

Since the duration of the bath must depend upon the general condition of the patient, as well as upon its effect upon his temperature, it is necessary that the treatment should be carried out under almost constant medical supervision.

Although in hospital practice the necessary appliances for carrying out the bathing treatment are always at hand, this is by no means the case in the patients' own homes, and it may be necessary to substitute some other means of applying external cold. Of such means the most satisfactory is the ice-pack, which has often proved very effectual, and, like bathing, has been followed by recovery in cases in which the maximum temperature has exceeded 110°. Sheets or towels wrung out in iced water may be applied to the surface of the body and limbs, and over these broken ice may be sprinkled. When the heat of the body has warmed the cloths, they should be replaced by others freshly wrung out in iced water, and also sprinkled with broken ice, and this may be repeated until the requisite effect is obtained. In a case recently recorded by Dr. Ord, the temperature was reduced by such means in three hours from 108.4° to 100°; and although the ice-pack had to be repeated four days later, the temperature having again risen to 105.2°, the patient ultimately recovered. Although in this case there were signs of both pericardial and pleural effusion at the time of the first ice-pack, these rapidly cleared up afterwards, and three days later had disappeared.

Antipyretic drugs seem to have little if any effect in checking the rise of temperature in these cases, and the symptoms may be developed in patients who are fully under the influence of salicylate. Moreover, as Dr. Ord says: "There is a good deal in the

action of every one of these remedies, when strongly pushed, which makes me fear that they may be doing harm in other ways while they are being used to reduce temperature." Chloral has been recommended by some as a useful drug in the treatment of cerebral symptoms which arise in the course of acute rheumatism.

Arthritis.—Under the salicylate treatment the articular pain and swelling of acute rheumatism so rapidly disappear, in the great majority of cases, that no treatment specially directed against the condition of the joints is required. It is, however, a common practice to wrap the affected joints in cotton-wool, a proceeding from which the patients appear to obtain a certain amount of relief.

Prior to the introduction of the salicylates many plans were devised for the relief of the articular pains, probably the most useful of which was the administration of opium as an anodyne. Some physicians have recommended that the joints should be fixed, by means of splints or by enclosing them in starched bandages, in order to ensure absolute rest to the parts. The application of pressure by means of bandages also had its advocates, while some applied ice-bags or cold compresses. Electricity was employed by some, and Drosdoff, Abramowski, and Beetz spoke highly of the efficacy of the induced current in relieving pain, but they regarded this treatment as merely a local palliative measure, having no effect upon the course of the disease. Weissflogg, on the other hand, considered that the use of the electric current was absolutely contra-indicated in acute articular rheumatism, although he acknowledged that it has a temporary anodyne effect of a very remarkable kind. His objection to the treatment was, that the effect is so transient that frequent application of electricity is necessary, while the parts become more and more sensitive with each application, until even the weakest current can no longer be borne. He thought, however, that electricity was useful in removing the residual and more chronic inflammatory condition, and in those cases in which a chronic synovial effusion results from the acute arthritis.

In 1874 Kunze advocated the injection of a 1 per cent. solution of carbolic acid under the skin over the inflamed joint, as an anodyne measure. This plan was extensively tried by Professor Senator, who published in 1875 his experience of the employment of this treatment in twenty-five cases. He commenced with a 1 per cent. solution, as recommended by Kunze; but considering this too weak, he increased the strength of the

solution first to 2 and then to 3 per cent. He limited the employment of this treatment to the most acutely painful joints, and never treated more than three joints at a time. He found that the injections had a very marked effect in relieving the pain and reducing the swelling, and that these effects were usually very obvious within an hour of the injection. In none of the cases did the carbolic acid produce any local inflammation, and no toxic effects were observed, the urine not being appreciably darkened in colour in any instance.

In the following year, Dieulafoy wrote in equally high terms of the subcutaneous injection of pure water over the inflamed joints, according to the plan originally introduced by Potain; and he found that the injection of so small a quantity as ten minims afforded almost immediate relief. Senator, who followed this plan in two cases, obtained no such satisfactory results.

I have already alluded to the value of the quino-alkaline treatment in removing the residual pains, which may be present for some time after the acute arthritis has subsided, and over which the salicylates often have no power.

When chronic synovitis results in one or more joints, an ice-bag sometimes proves useful, or the joint may be strapped with mercury and ammoniacum plaster. In many cases the application of a blister proves of great service, and this may be repeated if necessary. Residual stiffness may usually be removed by passive movements of the joints, performed under an anæsthetic if necessary, which movements serve to break down the fibrous bands which have formed around the joints.

Chronic Articular Rheumatism.—In the treatment of simple chronic articular rheumatism, warm clothing holds an important place. Indeed, any one who has suffered from rheumatic fever should wear woollen garments next to the skin, and should avoid all exposure and chill, especially when heated by active muscular exertion. When chronic articular rheumatism returns regularly with the onset of cold weather, much good may be obtained by the avoidance of the English winter, with its combination of cold and damp. Local treatment, such as painting with iodine, is often of service, as also is rubbing with a suitable liniment. As regards drug treatment, I have often seen great relief follow the alkaline or quino-alkaline treatment, and in some cases guaiacum combined with citrate of potash and bark has seemed to do much good. Iodide of potassium may often be added to the mixture with advantage. The salicylic drugs have seldom any marked effect in relieving the articular pains, except in those cases in

which the lesser chronic pains are increased by frequent very subacute attacks of a truly rheumatic character.

Among the drugs which have been recently recommended for the treatment of chronic articular rheumatism is ichthyol, a substance obtained by the distillation of a bituminous mineral, rich in remains of fossilised fishes, found near Seefeld in the Tyrol. This substance treated with sulphuric acid yields with the alkali metals, salts, which have received the name of sulpho-ichthyolates, having the appearance of tar, and a peculiar disagreeable odour. They contain a considerable proportion of sulphur, combined with oxygen, hydrogen, carbon, and traces of phosphorus. The drugs are administered internally (the sodium compound in doses of $2\frac{1}{2}$ grains in the form of a pill), and are applied externally to the affected joints, either in the form of ointment, or in solution in alcohol and ether.

Lorenz, Nussbaum, and others speak enthusiastically of the good effects obtained with ichthyol in the treatment of chronic articular rheumatism, rheumatoid arthritis, and other forms of chronic joint-disease, but Meyer and Troup have found it useless, and its administration attended by disagreeable effects, amongst which were eructations having the offensive taste and odour of the drug. Nussbaum, however, states that he himself took as much as five grammes of ichthyol in a day without any evil effects, and recommends the administration of 2–5 pills, each containing 0.1 gramme, twice daily.

Mineral Waters and Baths.—Although it is claimed for a very large number of mineral waters that they have a beneficial action in rheumatic cases, it is probable that this class of treatment has a less important place in the treatment of rheumatic than of gouty conditions. Rheumatic patients resort to mineral springs with two principal objects in view, namely, to obtain relief from the sequelæ of acute and subacute articular rheumatism, and to ward off, as far as possible, subsequent attacks. It will be well to consider these two points separately, as far as is possible.

In acute and subacute articular rheumatism, treatment by mineral waters is out of the question, and it is only after convalescence is well established that they should be resorted to. At this period the joints may either be the seats of a simple inflammatory process, of a more or less chronic character, or may develop the characteristic lesions of rheumatoid arthritis, of the treatment of which latter condition I shall have occasion to speak later.

In the treatment of chronic articular rheumatism, as of other

forms of chronic arthritis, baths, and douches, with or without the accompaniment of massage, are far more potent than the internal administration of mineral waters, and this must be remembered in selecting the places to which patients suffering in this manner should be sent. We have in this country several places which meet the requirements of such patients. Among the most important of these is Bath, where the arrangements recently made for the external use of the waters are of a most perfect description, and have been modelled to a great extent upon those in use at Aix-les-Bains. The Bath waters have the advantage of those of all other British spas in having a natural temperature of 104°–120° F. Their chief mineral constituent is calcium sulphate, and they also contain a small quantity of carbonate of iron. The course of treatment at Bath may be undergone during the winter months.

The sulphur springs are also valuable in the treatment of chronic articular rheumatism. At Harrogate there are very elaborate arrangements for administering baths of various kinds. The waters are not thermal, but are heated artificially to the required temperature. Strathpeffer in Ross-shire has also strong sulphurous waters, which may be compared to those of Harrogate.

The other important British sulphur springs are those of Llandrindod in Radnorshire, Moffat in Scotland, and Lindoosvarna in Ireland. The brine-baths of Droitwich also prove beneficial in many cases. The water, which is strongly impregnated with sodium chloride, is only used for external application. The Droitwich brine-baths may also be taken at Malvern, at which place the advantage of a very salubrious air is at the same time obtained. The water of Woodhall Spa, in Lincolnshire, contains, in addition to sodium chloride, considerable quantities of bromine and iodine, both free and in combination.

Among the Continental sulphur springs, Aix-les-Bains occupies a prominent place. Here the combined massage and douche bath is carried out with great skill, and the Aix system has been largely adopted in other places. The sulphur water has a natural temperature of 112°–114° F., and the supply is practically unlimited. At Aachen (Aix-la-Chapelle), in Rhenish Prussia, the waters are also sulphurous, and have a temperature of 114°–130° F. Here also the bathing arrangements are excellent. Among the other sulphur waters, those of Bagnères de Luchon (Haute Garonne), situated some 2000 feet above the sea, Barèges in the Pyrenees, situated 4000 feet above the sea, with a strongly sulphurous water, and Baden in Switzerland are

among the most frequented. The saline waters of Wiesbaden, in Nassau, have a temperature of 160° F.; here again the bathing arrangements are very complete. The waters of Royat, in Auvergne, enjoy a great reputation in the treatment of chronic rheumatic conditions; the waters are alkaline, and contain small quantities of arsenic and lithium. Their temperature is about 95° F.

Cardiac Complications.—One important question which arises with regard to the after-treatment of acute and subacute rheumatism is how far the existence of cardiac mischief must be held to contra-indicate treatment by baths. The great majority of practitioners agree in thinking that when the heart is the seat of organic disease, the use of baths is likely to be not only little beneficial, but even dangerous; but, on the other hand, there are those who maintain a directly opposite view. One of the most recent advocates of the bath-treatment of cardiac cases is Dr. Blanc of Aix-les-Bains. Dr. Blanc points out that the thermal treatment, by increasing the flow of blood through the capillaries, leads to increased cardiac action, and, as a consequence, to congestion in the heart, spleen, and liver, and that in some cases, if improperly employed, it may lead to sudden death; but he maintains that if the course is judiciously modified, and the patients are carefully selected, the Aix treatment has a power of causing the absorption of the vegetative outgrowths in recent cases, and the disappearance of murmurs which were to all appearance due to organic disease. He recommends that the patients should undergo the treatment within a month of the termination of the rheumatic attack in which the endocarditis had its origin. He does not consider that long-standing valvular disease is a contra-indication to the treatment, provided that the compensation is tolerably good. On the other hand, Dr. Blanc insists that the treatment is absolutely hurtful in atheromatous cases, in cases in which there is degeneration of the cardiac walls, or in which the disease is very advanced. He also regards the treatment as unsuitable for patients over the age of sixty. Dr. Monard, also of Aix, writes to somewhat the same effect, and says that thermal treatment, whilst warding off acute relapses, favours the reabsorption of the exudations on the valves, just as it reabsorbs the exudation around the joints. Mr. Freeman and Mr. Lane have been led to a similar opinion by their experience at Bath.

The Rheumatic State.—The successive attacks of gout are apt to occur at such comparatively regular intervals, that it is not

difficult to establish the fact that thermal treatment has a potent influence in warding off returns of the disease. When, however, we attempt to form an estimate of the efficacy of this treatment in rheumatic cases, much greater difficulties are encountered. These depend in part upon the fact that successive attacks of rheumatism are apt to occur at quite irregular intervals, and not a few patients exhibit no further rheumatic symptoms at any time during the remainder of their lives. An additional difficulty arises from the manner in which those who have written upon this subject have grouped together the various rheumatic and gouty manifestations as phenomena of arthritism, with the result that it is often impossible to form any idea of the value of mineral waters in combating the rheumatic, as distinguished from the gouty, state. The thermal treatments which appear to be most effectual in warding off subsequent rheumatic attacks are, for the most part, those which tend to improve the general tone of the system, and at the same time have some eliminative power.

In selecting particular Spas for rheumatic patients, it is important to consider the individual cases on their merits, and it is especially important that the course should be taken at a suitable season, as otherwise it will not improbably do more harm than good.

Buxton, with its elevated situation among the hills of Derbyshire and its bracing climate, holds a prominent position among British mineral water stations. The chief mineral constituent of the water is chloride of calcium, and it contains large quantities of nitrogen gas in solution. The temperature of the water is 81.5° F., and additional artificial heat is often needed to render it suitable for baths. In this connection also Harrogate, Strathpeffer, Llandrindod, and Bath may be again mentioned.

The waters of Wildbad, in Wurtemburg, resemble in character those of Buxton, and, like these, contain large quantities of nitrogen in solution. The natural temperature of the water is considerably higher (96° F.). At Gastein the mineral constituents of the water are but small in quantity; the temperature is from 95°–118° F.

Royat, Teplitz, Bourboule, Ragatz, and Pfäffers are also much frequented by rheumatic patients, and to these may be added Neris, Römerbad, Leuk, Baden near Vienna, Baden-Baden, Schinznach, Nauheim, Plombières, Mont Dore, Bourbon l'Archambault, Bagnères de Bigorre, and Dax.

In winter, when most European baths cannot be comfortably

visited, those of Algeria may be recommended. The chief thermal stations are those of Hammam R'Irha, near Algiers, and Hammam Meskoutin, near Bone. At the former place the baths are in the hotel, and all exposure is avoided. The latter is situated in a more interesting country, but is not suited to patients who are confined to the house. The temperature of the water is high at both places. The chief mineral constituent of the thermal waters is calcium sulphate.

BOOK II.

RHEUMATOID ARTHRITIS, OSTEO-ARTHRITIS, OR ARTHRITIS DEFORMANS.

CHAPTER I.

HISTORICAL AND INTRODUCTORY.

Evidence of the occurrence of rheumatoid arthritis in ancient times—References to the disease in earlier writings — Landré Beauvais — Heberden — Haygarth — Earlier studies of its morbid anatomy—The observations of Charcot and Trastour—Fuller—Garrod—R. Adams—Nomenclature—The morbid changes in the joints the same in all cases—The clinical varieties of the disease.

When some hitherto undifferentiated morbid condition is first described, the characters of which are so striking that it seems well-nigh impossible that they should have been long overlooked, it is often suggested that the malady is one of recent development, a new disease, which owes its origin to some alteration in the conditions of life.

In the case of the disease now to be considered, there is no room for any suggestion of this kind, for the evidence of its antiquity is derived, not from mere written descriptions, but from the impress which it has left upon the bones of its victims. The characteristic changes produced by rheumatoid arthritis were found by Chiaje in bones which had been unearthed among the ruins of Pompeii; by Virchow in skeletons obtained from the graveyard of the ancient convent of Marienthon in Pomerania; by Dr. Norman Moore in a skeleton found in a Roman sarcophagus in Smithfield, and by Mr. Eve in Egyptian bones of the Ptolemaic period; and the Norse Viking whose remains were found entombed in his war-ship in the neighbourhood of the Christiania Fjord was undoubtedly a sufferer from this same

disease. Nor are the earlier medical writers silent upon this subject, for we may clearly recognise the description of the clinical features of rheumatoid arthritis which is contained in the pages of Sydenham, who in his chapter on rheumatism says: "If it be unskilfully treated, it not unfrequently tortures the patient for months or for years, or even for the remainder of life, although under such circumstances it does not always attack him with equal vigour, but, like gout, in periodically recurring paroxysms. It may even happen that such pains cease spontaneously, after having been prolonged and severe, but in other cases the patients are deprived of all power of moving their limbs for the remainder of their lives; the joints in the fingers become, so to speak, inverted, and they exhibit nodular protuberances, such as are met with in gout, on the inner rather than the outer sides of the fingers; but may nevertheless retain their digestive functions unimpaired, and may be, in other respects, in good health." Somewhat similar, although less explicit, statements are to be found in the writings of Musgrave, De Sauvages, and Haller.

Landré Beauvais was the first to draw a distinction between two classes of cases which were at that time regarded as gouty, and in one of these classes he included examples of rheumatoid arthritis, describing them under the name of *Goutte asthénique primitive*. The thesis of Landré Beauvais, which was read on the 16th day of Thermidor in the year VIII of the French Republic (August 3, 1800), contained, in addition to the examples of rheumatoid arthritis above alluded to, others which were apparently cases of true gout, and others, again, of which the nature is extremely doubtful; and the inclusion together of a number of different maladies under one common name deprives his conclusions of much of the value which they would otherwise possess. Landré Beauvais called attention to the special liability of women to asthenic gout, to the chronic course which the disease runs; to the destruction of the articular cartilages which it causes, and to the enlargement and deformity of the patient's joints, which he showed could not be due to tophaceous deposits, such as are met with in true gout. The honour of having first recognised the distinctive characters of rheumatoid arthritis must therefore, I think, be conceded to Landré Beauvais.

The inclusion of these cases as gouty will excite no surprise when it is remembered that, at the time when this author wrote, the majority of his countrymen did not regard rheumatism as a true articular disease, in the strict sense of the term, and he

himself speaks of rheumatism as attacking the middle of the limbs and having its seat in the muscles, whereas gout is a disease of the joints. In our own country, on the other hand, such views as to the seat of rheumatism never prevailed; the cases of rheumatoid arthritis were included under the name of rheumatism, and it was from this disease that the differentiation had to be made.

In the year 1804, Heberden suggested that it was desirable to separate the affection now known as rheumatoid or osteo-arthritis from both rheumatism and gout, and briefly described the nodules upon the terminal phalanges of the fingers which still bear his name. In the following year (1805) appeared Haygarth's classical monograph, in which he indicated the distinctions which exist between rheumatoid arthritis and true rheumatism, and described the former as a distinct disease, under the name of nodosity of the joints. Haygarth's description was entirely clinical, and was based upon the observation of a series of thirty-four cases, which illustrated many of the more striking features of the malady. He says: "A case happened to occur to my observation at a very early period, which, compared with others at subsequent times, convinced me that there is one painful and troublesome disease of the joints, of a peculiar nature, and clearly distinguishable from all others by symptoms manifestly different from the gout, and from both acute and chronic rheumatism." Haygarth adds that he described this disorder in a paper written many years previously, but which was never published.

The thirty years which followed the publication of Haygarth's essay added but little to the knowledge of the clinical aspects of rheumatoid arthritis. Scudamore, writing in 1827, mentioned Haygarth's observations, but added that he had seldom met with the condition which he described except as a consequence of either gout or rheumatism. Brodie in his work on "Diseases of the Joints," published in 1833, spoke of the disease as bearing a relation to both gout and rheumatism, but as being essentially distinct from both; and in 1837 Chomel wrote very vaguely about the conditions described by Landré Beauvais. During this same period the study of the morbid anatomy of the process was advanced by the researches of Cruveilhier, Lobstein, and Aston Key, who were followed by a number of observers in the same field, pre-eminent amongst whom were Adams and Robert Smith in Dublin, Canton in London, and Deville and Broca in France. Drs. Adams and R. Smith showed that many cases of damage to the hip-joint, resulting from an injury, were of the nature of

rheumatoid arthritis, and so laid the foundation of our knowledge of the localised variety of the disease.

The publication of the inaugural thesis of MM. Charcot and Trastour in 1853 marked the commencement of a new era in the study of rheumatoid arthritis. The position which they had occupied as internes at the Salpêtrière gave to MM. Charcot and Trastour unrivalled opportunities of observing the disease, which is nowhere met with in greater profusion or in more typical forms than in that vast institution, and their theses, with that of their contemporary Vidal, contain a mass of clinical observations to which comparatively little remains to be added at the present day. Both Charcot and Trastour regarded rheumatoid arthritis as merely a form of chronic rheumatism, and their view has always held its own in France, finding expression in the later writings of Professor Charcot, as well as in the valuable encyclopædic articles of MM. Besnier and Homolle.

On the other hand, the majority of English and German physicians have always held to the opinion of Heberden and of Haygarth, that although rheumatoid arthritis presents certain superficial resemblances to both rheumatism and gout, it is in reality an entirely distinct disorder. This view was strongly maintained by Fuller and Garrod, the latter of whom showed that the excess of uric acid in the blood, which is so constant a feature in gout, is entirely wanting in rheumatoid arthritis, while both maintained that the cardiac lesions of true rheumatism have no place among its phenomena. Similar views were held by Dr. Adams, who has made such brilliant contributions to the study of the morbid anatomy of rheumatoid arthritis, and who showed the identity of the changes presented by the hip-joint disease of elderly people with those which characterise the articular lesions of the more generalised variety.

Since these authors wrote, the subject has been studied by a number of eminent observers, among whom are Mr. Jonathan Hutchinson, Dr. Ord, Sir Dyce Duckworth, and Professor Senator, and their studies have brought about a profound change in the prevailing views as to the nature of rheumatoid arthritis.

It is much to be regretted that no one name for the disease has met with universal acceptance, and there is no malady in the entire morbid series for which so many different designations have been proposed. Of these, the following are the most important:—

Chronic rheumatism of the joints (*Todd*).
Nodosity of the joints (*Haygarth*).
Goutte asthénique primitive (*Landré Beauvais*).

Chronic rheumatic arthritis (*Adams*).
Rheumatic gout.
Rheumatoid arthritis (*Garrod*).
Osteo-arthritis (*Nomenclature of the Royal College of Physicians*).
Rhumatisme chronique primitif (*Charcot and Vidal*).
Arthrite sèche (*Deville and Broca*).
Rhumatisme noueux (*Trousseau*).
Arthritis deformans (*Virchow*).

In selecting any one of these names, it seems to me to be desirable to avoid those which are based upon theoretical considerations, and also those in which the word "rheumatic" occurs, because I am convinced that by speaking of this disease as a rheumatic affection, one is tending to perpetuate an erroneous view as to its nature. I have employed "rheumatoid arthritis," not from any conviction of its superiority to all other names, but because it is one of those which is most widely used in this country at the present day.

Of all the names which have been proposed, "arthritis deformans" is perhaps the best, and it is in universal use in Germany. It might, however, be objected that the disease should not be styled arthritis at all, by those who hold that the inflammatory changes in the joints are merely secondary to nutritional changes.

All the cases included under the name of rheumatoid arthritis agree in one respect, and in one respect only, namely, in the character of the changes of which the joints are the seat. In all there is fibrillation and erosion of cartilage, and a tendency to the formation of osteophytic outgrowths, but clinically the group includes several distinct disorders. In their ætiology, in the sex which is more frequently attacked, and above all in the distribution of the lesions, there are wide differences; and since there is good reason for believing that the articular lesions are the sole, or almost the sole, primary manifestations of the disease, it seems to me that the features of rheumatoid arthritis are only to be explained by supposing that the characteristic joint-lesions are not the manifestations of a systemic disease, but rather the results of a disturbance of the nutrition of the joints, such as may be due to a variety of different causes, local or constitutional. In favour of this view is the fact that lesions very similar to, if not identical, in their essential nature, with those of rheumatoid arthritis, are met with in cases in which there is some definite nervous lesion as the primary event, of which the articular changes are apparently the secondary result; as an example of which, the arthropathies which are developed in the course of locomotor

ataxia may be quoted. Such cases can hardly be spoken of as examples of rheumatoid arthritis, but if the above view of the nature of that disease be adopted, we may define rheumatoid arthritis as a dystrophy of the joints which is not dependent upon any recognisable central lesion.

In grouping the cases according to their ætiology and clinical features, I shall follow the arrangement originally adopted by Charcot, merely adding a fourth to his three original divisions. In many instances rheumatoid arthritis appears as a primary and generalised disease, attacking many joints, and especially the peripheral joints, in a remarkably symmetrical manner. In this form it has many of the characters of a systemic malady such as rheumatism or gout, and it is on this account that it has so long been regarded as linked to these maladies by close ties. It is, however, clearly distinguished from them by the absence of the definite visceral manifestations, which, from the frequency of their association with the articular lesions, must be regarded as essential parts of those diseases. Visceral lesions are frequently met with, it is true, in association with polyarticular rheumatoid arthritis, but they have rather the characters of intercurrent disorders.

As a sub-variety of the polyarticular form of rheumatoid arthritis, we may include the extremely chronic affection which is limited to the terminal joints of the fingers, where it produces the small excrescences called after the physician who first described them, Heberden's nodes. Such nodes are also observed in association with more widespread affection of the joints, and are thought by some to be often of gouty rather than of rheumatoid origin.

I would here suggest the introduction of a group of cases in which the rheumatoid changes affect joints which have been the seats of other forms of disease, and which may be either monarticular or polyarticular according to the number of the primary lesions. In this secondary group I would include those cases in which rheumatoid arthritis develops as a sequel of acute articular rheumatism, gonorrhœal arthritis, or gout. Lastly, there is a localised variety, of which the hip-joint disease of advancing life is the most typical example, which usually follows a local injury, slight or severe, and differs widely from the polyarticular form in attacking the larger and more central, instead of the smaller and peripheral joints; in showing little tendency to spread or to symmetrical invasion, and in attacking men more commonly than women.

Of these four varieties, the primary polyarticular is by far the

most important, on account of the damage which it causes to many joints, and the consequently more serious suffering and crippling which it entails. Usually it has its generalised character from the commencement; but the disease, although beginning locally, may become generalised in time.

It is best to discuss each of the above varieties separately, as by so doing one obtains a more satisfactory notion than would otherwise be possible of the differences which exist between the various disorders grouped together under the comprehensive name of rheumatoid arthritis.

CHAPTER II.

POLYARTICULAR RHEUMATOID ARTHRITIS.

Ætiology.

Heredity—Special liability of women—Influence of age—Of the menopause—Of uterine disorders—Of child-bearing—Of worry and trouble—Of shock—Of damp and cold—Of injury.

THE causes of polyarticular rheumatoid arthritis are, for the most part, such as lead to a deterioration of the general health or to a disturbance of the nervous system. This fact has important bearings upon the question of its pathology, and affords a valuable indication of the line of treatment which is most likely to be attended with success.

Heredity.—Not infrequently the disease attacks several members of the same family, but the influence of heredity is here much less clearly marked than in the case of rheumatism or gout. In studying the extent of this influence, great difficulties are encountered, the chief of which is due to the fact that this malady has no distinct place in popular nosology, being usually spoken of as rheumatism or rheumatic gout; whilst the name rheumatic gout is also frequently applied to true gout. When to this are added the many difficulties which surround any investigation of hereditary tendency, it is obvious that even the approximate estimation of this factor is no easy matter.

Professor Charcot obtained satisfactory family histories of rheumatoid arthritis from 11 out of a total of 41 patients whom he interrogated; and among 500 cases which I collected from my father's note-books, from which the various statistics which I shall quote in this chapter were derived, there were 84 in which family histories of articular disease, probably of this nature, were obtained. This gives a percentage of 16.8, which is considerably lower than those yielded by cases of rheumatic fever or gout. It

is further interesting to note that no fewer than 216, or 43.2 per cent., of the patients gave histories of articular diseases in their families, amongst which gout held a more prominent place than rheumatoid arthritis itself. Only 12.8 per cent. of the patients gave family histories of rheumatism. The proportion of gouty heredity in these cases is probably much higher than would be obtained from an equal number of hospital cases, whereas the proportion of rheumatic heredity is even much less than that yielded by 500 non-rheumatic hospital patients, among whom the percentage was about 20.

In the following table these facts are set out in greater detail:—

Family history of gout	64
,, ,, doubtful gout	10
,, ,, rheumatism	48
,, ,, rheumatoid arthritis	11
,, ,, hand-joint affection	14
,, ,, joint-affection	24
,, ,, rheumatic gout	1
,, ,, deformed joints	1
,, ,, crippling by rheumatism	11
,, ,, sciatica	2
,, ,, gout and rheumatism	7
,, ,, gout and hand-affection	5
,, ,, gout and crippling	2
,, ,, gout and joint-affection	1
,, ,, gout and deformed joints	6
,, ,, gout, rheumatism, and rheumatoid arthritis	1
,, ,, rheumatism and joint-affection	4
,, ,, rheumatism and sciatica	1
,, ,, rheumatism and crippling	1
,, ,, rheumatism and rheumatoid arthritis	1
,, ,, rheumatism and hand-affection	1
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Sir Alfred Garrod, Sir Dyce Duckworth, and other observers have thought that rheumatoid arthritis is exceptionally common in the female members of gouty families, and the statistics above given certainly tend to support that view. Amongst those cases in which the disease commences at an exceptionally early age, there is no higher percentage of rheumatoid heredity than among those who are attacked late in life. In some particular instances the influence of hereditary tendency is very well marked, and it is by no means uncommon to see two or more sisters suffering from rheumatoid arthritis. One of my hospital patients, who suffered from the disease in a most typical form, stated that her father and mother both had enlarged joints; that she was one

of a family of fifteen children, six of whom grew up, and that her three brothers and two sisters suffered from enlargement of the joints as she did.

Sex.—The two sexes suffer very unequally from polyarticular rheumatoid arthritis. Whereas gout especially attacks males, and the incidence of rheumatism upon the sexes is nearly equal, amongst the sufferers from polyarticular rheumatoid arthritis there is an enormous preponderance of women. This fact is so generally recognised that it is hardly necessary to quote figures to prove it; it has been noticed from the earliest days of our knowledge of the disease, and was specially remarked by Landré Beauvais and by Haygarth, of whose 34 patients only one was a man. Of the 500 cases, 411 occurred in females, and only 89 in males; but even this proportion of men is somewhat too high, since a few cases of the localised variety were included, and this is at least as common, if not commoner, in males. The special liability of the female sex appears to depend upon several causes, prominent among which is the potent influence of uterine derangement and of the cessation of the menstrual function.

Age.—Rheumatoid arthritis is essentially a disease of the early degenerative period of life, and its frequency attains its maximum among persons between forty and fifty years of age. It may, however, even attack children, and is not very uncommon in young adults, in whom it usually assumes its more acute and rapidly-spreading form. Cases occurring in childhood have been recorded by Dr. Moncorvo of Rio, Sir Alfred Garrod, and others, and several cases of this kind have come under my own notice.

An examination of the 500 cases shows that the number of female cases increases almost steadily with each five-year period until that between forty-five and fifty was reached, and that after this the numbers rapidly decline; and that this decline is not merely due to the fact that fewer people are alive beyond that age is shown by a comparison with the male cases, which do not decrease in number until seventy is passed. The male cases show no such continuous increase, and two maxima are noticed, one between thirty and thirty-five, and the other between fifty and fifty-five. The ages given are those at which the disease was stated to have commenced, and not those at which the patient came under observation.

Age at Commencement.	Women.	Men.
0— 9 years ...	3 ...	0
10—19 „ ...	18 ...	4
20—24 „ ...	21 ...	3

Age at Commencement.	Women.	Men.
25—29 years ...	33 ...	7
30—34 „ ...	33 ...	10
35—39 „ ...	37 ...	5
40—44 „ ...	51 ...	5
45—49 „ ...	57 ...	8
50—54 „ ...	51 ...	12
55—59 „ ...	37 ...	10
60—64 „ ...	29 ...	10
65—69 „ ...	23 ...	10
70—79 „ ...	2 ...	3
80—90 „ ...	1 ...	0
Doubtful ...	15 ...	2

The Menopause.—The influence of the menopause, which is probably responsible for the special liability of women between forty and fifty, has long been recognised as playing an important part in the causation of polyarticular rheumatoid arthritis. Haygarth says:—"These nodes are almost peculiar to women, and usually begin about the period when the menses naturally cease;" and again, "only three of the thirty-three women had nodes during the period of regular menstruation." Of 411 female patients, eighteen dated the commencement of the disease from some time in the two years immediately preceding the menopause, and no less than forty-one from the two years immediately following that event; in five more the disease began at the climacteric. Dr. Fuller says:—"In almost every instance which has fallen under my notice of its occurrence in early life, it has been either hereditary, or else connected with disordered uterine function."

Uterine Disorders.—Dr. Ord has especially insisted upon the importance of uterine disorders as causes of rheumatoid arthritis, and in a paper read before the Clinical Society of London, he gave some statistics based upon thirty-eight cases occurring in women from all stations of life. In no less than thirty of these cases some such derangement, slight or severe, was present. In three instances the articular disease was strictly unilateral, and in those there was ovarian pain and tenderness on the same side as the articular lesions. Dr. Ord also observed that, in a considerable proportion of cases, paroxysms of articular pain coincided with the successive menstrual periods. Sir Alfred Garrod, on the other hand, is inclined to attach more importance to the lowered general health upon which uterine disorders so often depend, than to the uterine troubles themselves, and he points out that the appearance of the disease may follow the onset of sudden debility, after severe hæmorrhage or rapid child-bearing.

Amongst the 411 cases, there were 176 in which the condition of the catamenia was noted. In 105 of these cases the menstrual periods were stated to be normal, whilst in the remaining 71 there were abnormalities either of period or quantity. Of the 411 female patients, 207 were married, and 144 were single. The number of the family of 132 of the married patients was noted, and of these 92 had fewer than six children, and 40 had more. Two patients had 13, one 15 children, and one had borne 17 children, and had had, in addition, three miscarriages. In only five cases was the disease stated to have commenced soon after a confinement; in three others its onset followed a miscarriage, and in three it began during pregnancy. It is curious to observe that the occurrence of pregnancy during the course of the disease appears to exert opposite influences in different cases, in some instances accelerating the progress of the malady, in others acting as a temporary check upon its development.

Emotional Causes.—In another important group of cases, rheumatoid arthritis appears to originate as a consequence of mental or emotional causes. It is remarkable how frequently a period of mental anxiety due to business embarrassment or family troubles, such as the prolonged illness of relations, precedes the onset of rheumatoid arthritis. Professor Senator lays special stress upon such antecedents, and Sir Alfred Garrod and several other authors have also called attention to the subject. The following examples illustrate this point. A male patient, who had always previously enjoyed good health, was suddenly attacked with rheumatoid arthritis of the hands, feet, and knees, which exhibited the characteristic osteophytic enlargement. He himself ascribed the onset of the disease to worry consequent upon business anxiety, and the loss of his mother. A young woman, aged twenty-five, who suffered from a severe form of rheumatoid arthritis in the hands, feet, ankles, knees, and elbows, stated that the onset of the disease followed a period of worry which extended over several months. Among the 500 cases there were 34 in which such antecedents were mentioned, including bank failures, sick-nursing, and so on.

The influence of emotional disturbances is by no means limited to the causation of rheumatoid arthritis, but is also well marked throughout its course, so that the patients themselves often volunteer the information that any anxiety or worry is invariably followed by an exacerbation of the articular pains.

Shock.—As a rule, when the onset of the disease is attributed

to mental causes, these have been in action over a considerable period; but there is reason to believe that a sudden and violent shock may be sufficient in itself to start the morbid process. Two remarkable cases, in which this was apparently the case, have been recorded by Kohts; both of the patients being men who fell victims to rheumatoid arthritis after receiving violent mental shocks from the explosion of shells in their immediate vicinity. Further evidence of a similar kind is supplied by Professor Leyden, who states that many of the sufferers from rheumatoid arthritis in Strasburg, date their troubles from shocks, of the same kind, received during the bombardment of the city in the year 1870. In other instances the disease is dated from a short period of intense anxiety.

Damp and Cold.—Damp and cold, and especially a combination of the two, are regarded by Professor Charcot as among the most potent causes of the disease, but Charcot considers that the exposure to such conditions requires to be prolonged in order to produce this effect, and he adds that the articular lesions may not develop until some time after the cause has been removed. The patients often ascribe the onset of their malady to getting wet through, or sleeping in a damp bed; and in one instance which came under my notice, there was a history of a prolonged immersion in a river, very shortly before the commencement of the symptoms. Exposure to cold and damp are so often associated with insufficiency of food, and other influences prejudicial to the general health, that it is difficult to form an estimate of their true importance, but it cannot be questioned that they occupy a very important place among the causes of rheumatoid arthritis. Nor is it only as causes of the disease that cold and damp are important, for they undoubtedly have an effect in increasing the sufferings of those who have already developed the malady, whose pains usually vary in severity with every change of wind or weather.

Injury.—The influence of injury is far more marked in the localised than in the polyarticular variety of rheumatoid arthritis, but cases are met with in which the more general form follows an injury to a single joint, one articulation after another being attacked. An interesting example of this kind has been recorded by Mr. M'Ardle. A man, aged fifty-seven, who came to me suffering from affection of the small joints of the hands, the right shoulder, and right hip, dated the onset of the disease from a kick from a horse upon the right hip sixteen years previously. He stated that he had suffered in the hip ever since,

and the other joints had become involved about ten years later. Here the interval is so long that it seems not improbable that the disease only commenced years after the injury, attacking first the injured joint. As a further example, I may quote the case of a woman, aged fifty-six, who stated that she had fallen and struck the left knee twenty years before I saw her, and that the joint had been painful ever since. The disease had gradually spread until it involved the right knee, the joints of some of the fingers, and the metacarpo-phalangeal joints of the thumbs.

Injury of another kind, such as results from acute inflammatory lesions of joints, is apparently another potent cause of rheumatoid arthritis, which may be developed as a sequela of acute rheumatic, gouty, or gonorrhœal arthritis, but of these secondary forms I propose to speak in a separate chapter.

Dietetic errors, which play so important a part in the causation of gout, do not appear to have any share in the production of rheumatoid arthritis, which results far more commonly from insufficiency of food than from over-indulgence. Nor does the use of alcoholic beverages in moderation appear either to produce the disease, or to exercise any but a beneficial action when it is once developed.

In some of the cases which occur at an unusually early age a history of poverty and want is obtained, and, speaking generally, it may be said that rheumatoid arthritis is apt to attack those whose vitality is lowered by depressing influences of any kind; hence the first aim in its treatment should be the removal of the sufferer from such influences.

CHAPTER III.

CLINICAL FEATURES OF POLYARTICULAR RHEUMATOID ARTHRITIS.

Early symptoms—Observations of Dr. Spender—Acute rheumatoid arthritis—Subacute variety—Rheumatoid arthritis in childhood—Chronic form—Relative liability of different joints—Centripetal extension of the lesions—Symmetry—Unilateral cases—Liability of the temporo-maxillary joints—Spondylitis—Clinical features of the articular lesions—Ulnar deflexion—Enlargement of bursæ—Creaking.

Premonitory Symptoms.—In many instances the earliest indication of the onset of the polyarticular form of rheumatoid arthritis is some enlargement of one or more joints, and a certain amount of pain when these are moved; but premonitory symptoms are not infrequently present, preceding the development of the articular lesions by a longer or shorter interval. Such early symptoms often assume the form of some sensory disturbance, such as a numbness or tingling in the extremities of the limbs. These phenomena have attracted but little attention from clinical observers, but they are alluded to by Drs. Howard and Homolle, the former of whom compares them to the sensations experienced at the commencement of certain spinal disorders. One of my patients, a woman aged fifty-two, informed me that for about a year before any of her joints became affected she had experienced a sensation of pins and needles in the hands and arms, and growing pains in the bones of these parts. In a number of other cases I have obtained similar histories.

Dr. Spender of Bath has directed attention to certain other symptoms which he has observed in the earliest stages of the disease. Prominent among these is a marked increase of the pulse-rate associated with high tension. Such increase of the pulse-rate is undoubtedly a feature in many cases of rheumatoid arthritis, and palpitation of the heart is by no means uncommon, as was first pointed out, I believe, by Sir Dyce Duckworth. In

some instances I have observed a pulse-rate of as many as 130 beats per minute, without any apparent cause.

Dr. Spender also lays very great stress upon the importance of pigmentary disturbance as an early symptom, and writes: "Concerning the disseminated form of pigmentation, commonly called freckles, I must express an opinion that there is no single point so diagnostic, so absolutely connotative of early osteo-arthritis. My observations lead to the belief that it exists in about two-thirds of the undoubted cases." Upon this point, my own experience does not entirely agree with that of Dr. Spender, for I have been unable to convince myself that pigmentary disturbance is more common amongst sufferers from rheumatoid arthritis than amongst others, although I have, in one or two instances, seen pigmented areas of a remarkable character in such patients.

I have met with such local sweating as Dr. Spender describes in a large number of cases, and have frequently found the hands of the patients moist, even in cold weather. The sweating may be confined to a limited area, such as the forehead or hand, or may extend over a considerable part of the surface of the body. In some instances it is noticed by the patient before the development of the articular lesions.

The pains of which the sufferers from rheumatoid arthritis complain are of a variety of kinds, and, amongst these, pains of a neuralgic character have, as Dr. Spender points out, an important place. Sometimes, on the other hand, the pain is referred to the bones, but more usually to the joints themselves; and the most intense suffering to which such patients are liable results from muscular cramp, the tendency to which is associated with the increase of myotatic irritability in the wasted muscles, which causes them to pass readily into a condition of painful spasm. Dr. Spender attaches much importance to a neuralgic pain in the ball of the thumb, or upon the inner side of the wrist, which he regards as almost pathognomonic of the earliest stages of rheumatoid arthritis.

Acute Rheumatoid Arthritis.—Both Fuller and Garrod have described the occasional acute onset of rheumatoid arthritis, in a form in which it may readily be mistaken for acute rheumatism, from which it is chiefly distinguished by the greater limitation of the articular swelling to the synovial capsule and its offshoots, the special liability of the smaller peripheral joints, and the extreme obstinacy of the disease. There is also an absence of any tendency to profuse acrid sweating, or to affection of the endocardium or pericardium. When the disease begins in this

manner there is usually some constitutional disturbance, but the temperature rarely rises to any great height. That cases of this kind do occur I am convinced, although they are not very common, and they must be carefully distinguished from those cases in which rheumatoid arthritis appears as a sequela of true rheumatic fever.

As time goes on the articular affection, over which the salicylates have little power beyond that of easing the pain to some extent, assumes a more typical form, and the formation of osteophytic outgrowths around the articular ends of the bones confirms the diagnosis. Some authors, among whom is Dr. Spender, deny the occurrence of this more acute form of rheumatoid arthritis, and regard the cases so described as merely examples of the development of the disease as the sequel of a subacute rheumatic attack.

Subacute Form.—There is another variety which may be described as subacute, and which, like the above-mentioned form, is chiefly met with in young subjects. In such cases the enlargement of the joints, and the consequent muscular atrophy, are unusually rapidly produced, the disease invading many joints in quick succession, so that in the course of a few months the patients may become practically crippled.

Rheumatoid Arthritis in Children.—When rheumatoid arthritis occurs in childhood it usually assumes this rapidly progressive form, but at the same time it retains its essentially articular character, and none of the characteristic visceral lesions which play so important a part in the rheumatism of childhood are developed in its course.

It must be remembered, in studying these cases, that there are other forms of chronic arthritis of many joints, which occur in children, in which deformities somewhat resembling those of rheumatoid arthritis are met with, but which lead to no enlargement of the heads of the bones. Two cases of this kind will be found recorded in the twenty-second volume of the Clinical Society's Transactions, one by Dr. Pasteur, and the other by Dr. Barlow. In both these cases there was a somewhat hide-bound condition, which suggests analogies with the cases already referred to, in which a form of chronic arthritis developed in connection with scleroderma; and the cases also present certain resemblances with those described by Jaccoud and others under the name of "*rhumatisme fibreux.*" In Dr. Barlow's case some excrescences resembling subcutaneous rheumatic nodules were present. Cases of a similar nature have been described by

Wagner of Munich (*Münchener Med. Wochenschr.* 1888). A considerable number of cases of undoubted rheumatoid arthritis in childhood are now on record, and the characters of the disease as it is seen at that period of life are well illustrated by the following examples which I have had the opportunity of observing. A little girl, aged nine years, a twin, whose father and brother had suffered from rheumatic fever, was observed to walk lame, in consequence of a painful swelling of both knee-joints. Similar swellings soon followed in the wrists and small joints of the fingers, and as the heads of the bones became enlarged in all these situations, the parts assumed the appearance which is so typical of the disease. The child improved greatly under treatment with iodide of iron, cod-liver oil, &c., and was able to walk for some distance ; but she became worse again after a time, with a return of pain and stiffness in many joints. The heart, which was examined at intervals during a period of a year and a half, never showed any sign of damage.

Another child, a girl aged ten years, who had always been delicate, and who had for some time been without sufficient nourishment, owing to her father being out of work, was attacked with pain in the middle joint of the right middle finger. Other interphalangeal joints soon became affected, and when she was first seen the mid-joints of the right, middle, ring, and little fingers, and also that of the left middle finger, were much enlarged by osteophytic outgrowths, and the wrists also were swollen and painful. The muscles of the arms and forearms were considerably atrophied, and the hands were becoming deformed by muscular contracture. In this case also the examination of the heart revealed nothing abnormal. It will be seen from the above examples that the interest which attaches to rheumatoid arthritis in children is not due to any marked peculiarities of the disease at that period of life, but rather to its rarity.

Cases have been observed in which the disease commenced at a considerably younger age than in those which I have described. Sir Alfred Garrod mentions that he has seen it in a child of four, and Dr. Moncorvo of Rio has recorded the case of a still younger patient. In some of the cases occurring in very young children the disease is marked rather by the extreme swelling of the affected joints, than by the production of deformities similar to those observed in older patients.

In Advanced Life.—In advanced life rheumatoid arthritis is usually an extremely chronic disease, spreading but slowly from

joint to joint, and attended by comparatively little pain; but this is by no means always the case, and the disease may assume a subacute form in patients of any age.

Distribution of Lesions.—In polyarticular rheumatoid arthritis the small joints of the hands are most liable to be attacked, and not infrequently the disease remains limited to the terminal interphalangeal joints, causing the enlargements known as Heberden's nodes. Professor Charcot found that in no less than 25 out of a total of 41 cases which he observed at the Salpêtrière, the joints of the hands and feet suffered for a considerable period before any others were attacked; Haygarth noted the presence of the disease in the joints of the hands in 20 out of a total of 34 patients; and of the 38 cases given in Dr. Ord's table, there were 24 in which these same joints were implicated. From the examination of the notes of 500 cases, I found that in no less than 252 the disease commenced in the hands; in 64 in the knees; and in 28 in the feet; whilst in as many as 430, or 86 per cent., the joints of the hands became implicated at some period of the disease. Not only is the disease particularly apt to attack the peripheral joints, but also there can, I think, be little doubt of the truth of the statement first made by Professor Charcot, that the lesions tend to advance up the limbs from the periphery towards the trunk, although in many cases no such regular order of progression can be made out. In some individual instances this order of progress is very strictly observed. In a case which I had opportunities of observing over a long period, the joints of the feet were first attacked, and almost simultaneously the jaw was noticed to be stiff at times. Then the ankles, knees, hands, wrists, elbows, shoulders, and hips became involved in the above order.

If it be a fact that the centripetal extension of the disease is at all general, it should be observed in the totals of a large series of cases in all stages of the disease, for those joints which are apt to suffer earliest should be attacked in the largest proportion of cases, and so on. To test this I constructed the following table, which shows the numbers of cases in which the individual joints suffered out of a total of 500. In this table the small joints of the hands and feet are grouped together:—

Joints Affected.		Total.		Percentage.
Hands	...	430	...	86
Knees	...	303	...	60.6
Feet	...	172	...	34.4
Ankles	...	137	...	27.4

Joints Affected.		Total.		Percentage.
Wrists	...	133	...	26.6
Shoulders	...	125	...	25
Elbows	...	125	...	25
Hips	...	73	...	14.6

It will be noticed that the centripetal order is only broken in the case of the knees, which joints appear to be especially liable to the development of all kinds of arthritis, and which, in acute rheumatism, occupy the first place in order of frequency.

The most remarkable feature in the distribution of the lesions of rheumatoid arthritis is their extreme symmetry, which is not merely seen in the simultaneous or consecutive invasion of corresponding joints, but even extends to the portions of the cartilage which are destroyed in each. Indeed, if the symmetrical joints are opened *post-mortem*, they will often be found to correspond almost exactly in appearance, the position of the lesions in the one being merely reversed in the other.

When the small peripheral joints suffer, the symmetrical distribution of the arthritis is especially well marked, and in some instances a most complex arrangement of digital lesions in one hand or foot will be found to be exactly reproduced in the other. Again, it not infrequently happens that the disease commences in the same single joint of the two hands. Occasionally all the joints of one side of the body suffer more severely than those of the other side, and in rare instances the disease is strictly unilateral, as in the case of a woman, whose right elbow, right knee, and right temporo-maxillary joint were involved, and who also complained of pain in the right side of the cervical spine.

Some articulations, which are little liable to be attacked in the course of other diseases which implicate the joints, exhibit a special liability to rheumatoid arthritis. This is notably the case with the temporo-maxillary joint, which was affected in no less than 125 out of 500 cases; but it is a remarkable fact that although the changes in this joint are sometimes extreme, so that all movement of the jaw is prevented by the interlocking of osteophytes, more commonly the patient merely experiences some stiffness of the articulation, which may be permanent or temporary. Sir Alfred Garrod regards the affection of this joint as a most valuable diagnostic sign of rheumatoid arthritis, and I am convinced that it is so. In true rheumatism the jaw-joint is very seldom involved, but it is more liable to gonorrhœal arthritis. Some stiffness of the neck is also frequently complained of,

and its presence was noted in 178 of the 500 cases. Such stiffness, which is quite distinct in character from that which results from muscular affections, and which may be attended by grating on movement, is probably due to the presence of spondylitis of the cervical spine.

Clinical Features.—The earliest obvious change observed in a joint which has become the seat of rheumatoid arthritis is usually some enlargement, which is chiefly due to an increase in size of the articular ends of the bones, but which is in most instances rendered more conspicuous by distension of the synovial capsule with fluid, or by a similar distension of the bursæ in the neighbourhood of the joint.

Heberden's nodes are mostly due to bony outgrowth, but even their size may be considerably increased by bulging of the synovial membrane, which may project as small translucent cystic protuberances upon the dorsal aspects of the joints. In

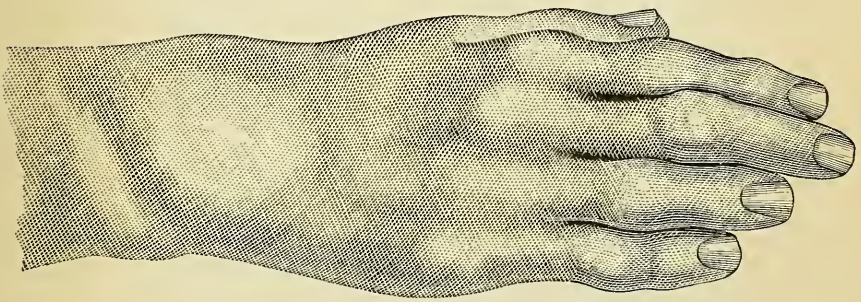

Fig. 10.—Hand of Young Woman aged Twenty, showing the Changes produced by Early and Rapidly Progressive Rheumatoid Arthritis.

extreme cases there is a well-marked deflection of the terminal phalanges towards the radial side, which is rendered more conspicuous if the fingers are deflected to the ulnar side.

This radial deflection of the terminal phalanges is irreducible from the first, and apparently results from the excessive formation of osteophytic outgrowths upon the ulnar side of the joint. It is limited to the terminal joints, the other interphalangeal joints undergoing fusiform enlargement without lateral distortion.

The knuckles become large and nodular, and when they are attacked the ulnar deflection of the fingers soon develops. The causation of this second kind of deformity is somewhat obscure. It is never met with except as a result of articular disease, but it may be developed after true rheumatic fever in cases in which the joints show no other signs of permanent damage, and, unlike

the radial deflection of the terminal phalanges, it is easily reduced in its earlier stages.

However this deflection is brought about, it would seem that the relaxation of the ligaments which results from articular disease is a necessary factor in its production, and in cases in which the muscular deformities which are met with in rheumatoid arthritis are reproduced as the results of nerve-lesions, ulnar deflection is not observed. It is not easy to imagine that contraction of the extensors, although the tendons do pull a little towards the ulnar side, could produce this deformity, as

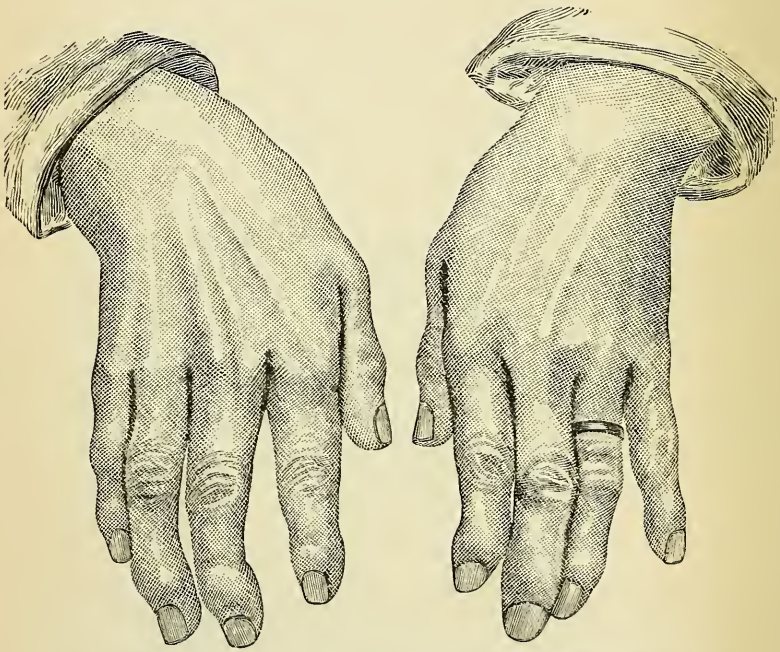

Fig. 11.—Radial Deflection of the Terminal Phalanges of the Fingers, resulting from Rheumatoid Arthritis of the Terminal Interphalangeal Joints.

long as the tendons lie in their proper grooves, and it is only in very extreme cases that they are found to lie outside them. Dr. Herringham suggests that when the abductor indicis is atrophied, the unsupported index finger pushes the others to the ulnar side (and this is probably another factor in the production of the deformity), but, as Sir Dyce Duckworth points out, such atrophy is not constant in these cases.

Seeing that articular lesions always precede its development, I am inclined to believe that ulnar deflection does not depend upon muscular action, but upon the weakening of the support

given by the ligaments of the metacarpo-phalangeal joints, in consequence of which the fingers fall towards the ulnar side.[1]

When the terminal joints are alone involved, the thumb, as a rule, escapes entirely, but its joints are attacked in the more generalised cases; and there is one variety of the disease, by no means rare, in which the morbid changes are limited to the carpo-metacarpal joints of the two thumbs.

The enlargement of the wrist tends to abolish the natural contour of the part, and the forearm, from elbow to hand, appears as a shaft of almost uniform thickness, and here especially the enlargement of the neighbouring bursæ adds greatly to the deformity which is produced. In cases in which the elbow is involved, I have often had opportunities of verifying Dr. Adams' statement that the bursa over the olecranon is often distended with fluid, and may contain a cartilaginous body. In the case of the other large joints similar changes are observed, but the shoulder and hip being more deeply seated than the rest, it is less easy to make out their exact condition, and it is chiefly by the limitation of their movements, and the slowly progressive character of the changes, that the diagnosis is arrived at.

When the disease is more or less acute the skin covering the affected joint may be somewhat reddened, but usually it retains its natural appearance, unless it has undergone dystrophic changes. In the early stages the movements of the joint give rise to crackling, such as is met with in other forms of chronic arthritis; but when the disease is more advanced, the friction against each other of the bony surfaces, which have been denuded of their cartilaginous covering, produces a peculiar grating which is very characteristic, and is one of the most valuable diagnostic signs when the more deep-seated joints are attacked.

In its more acute form, which was described by Fuller and Garrod, when the temperature of the body is raised, and the signs of synovitis are present, whilst the osteophyte formation is as yet hardly perceptible, rheumatoid arthritis may be, and probably not infrequently is, mistaken for acute or subacute rheumatism; but in the more chronic form, the steadily progressive character of the disease and the marked enlargement of the heads of the bones usually render the diagnosis easy.

[1] In the healthy hand some degree of ulnar deflection can be readily produced by pressure, but no similar deflection to the radial side is possible.

CHAPTER IV.

CLINICAL FEATURES OF POLYARTICULAR RHEUMATOID ARTHRITIS—(*Continued*).

Muscular atrophy in rheumatoid arthritis—A variety of arthritic muscular atrophy—Increase of tendon reflexes—Electrical reactions—Variations in myotatic irritability in different cases—Spasms—Ballet's observations of clonic spasm—Muscular deformities not peculiar to rheumatoid arthritis—Charcot's types of deformity—Effect of previous nerve-injury on the deformities—Dropped wrist with rheumatoid arthritis—Cutaneous dystrophy—Other dystrophic changes—Secondary sensory disturbances due to spondylitis—Evidence of the association of visceral lesions with rheumatoid arthritis—Charcot's views—Endocarditis and pericarditis—Ocular affections—Aphonia—Psoriasis—Temperature—Urine—Causes of death—Course of the disease.

Muscular Atrophy.—The development of rheumatoid arthritis in any joint is followed, sooner or later, by atrophy of the muscles which control its movements. This atrophy varies very greatly in amount in different cases, being, in some cases, so slight as to be hardly noticed, whereas in others it reaches an extreme degree, and greatly increases the deformity which results from the enlargement of the articular ends of the bones.

The muscular atrophy of rheumatoid arthritis supplies a particular example of a general law that any morbid process in a joint is apt to be attended by atrophy of neighbouring muscular structures. The extensors of the affected joint are most affected, but they do not exclusively suffer. As a rule, the tendon-jerks of the affected limbs are markedly increased, and this may be the case with the reflexes of the other limbs also. The selective character of the atrophy and this increase of the tendon-reflexes afford in themselves sufficient proof that the changes in the muscles cannot be set down to mere disuse, and they are usually attributed to some reflex nervous influence, having its origin in the peripheral nerves of the affected joints. Writing upon this question, Dr. Gowers points out that the atrophy which results from disuse is trifling and tardy, and affects the muscles of the disused

limb generally ; and he further shows that the implication of the entire length of the affected muscle precludes the possibility of arthritic atrophy being due to any local inflammatory change extending from the inflamed joint. He further points out that the observed changes in the muscles are such as often result from slight degeneration of the pyramidal tracts in the spinal cord, and which must, he considers, be due to changes in the termination of the pyramidal fibres in the grey matter. In rheumatoid arthritis, with its slowly progressive destructive lesions, the peripheral irritation must be especially intense ; and it is, therefore, not surprising that arthritic muscular atrophy should be observed in its most extreme form in connection with this disease.

The atrophy of rheumatoid arthritis resembles other varieties of arthritic muscular atrophy, not only in its distribution, and in its association with increased myotatic irritability, but also in the absence, in the great majority of instances, of the reaction of degeneration, which, when present, is usually limited to one or more of the muscles in which the wasting is most extreme. Fibrillary twitchings are sometimes observed in the wasted muscles.

Excessive Tendon Reflexes.—The increase of myotatic irritability is by no means invariable, and in two cases apparently similar, in which the atrophy is of like degree, the reflexes may be markedly increased in one, normal or diminished in the other. Among fifty cases of rheumatoid arthritis in which I examined the supinator-, triceps-, and knee-jerks, I found a distinct increase of one or more of the reflexes in thirty-two. Of twenty-three cases, in which there was conspicuous muscular atrophy, the reflexes were increased in eighteen ; whereas of twenty-seven cases, in which the atrophy was slight, there were fourteen in which the reflexes were exaggerated. The joint-lesions seldom interfered with the testing of the jerks, but when the joints were rendered stiff by disease, or were very painful, the examination was, of course, omitted. The most excessive jerks were not infrequently obtained in cases in which the joints were the seats of advanced changes. Some of the observations seemed to show that when one limb is attacked before the corresponding one of the other side, the reflexes are often more markedly increased on the side which has been more recently involved. As in other varieties of arthritic muscular atrophy, the increase of myotatic irritability is often not confined to the affected limb. When one hip only is attacked, both knee-jerks, and even the supinator- and triceps-jerks also may be excessive.

In some instances the exaggeration is very remarkable. Dr. Mader has recorded the case of a woman, aged forty-three, who had suffered from rheumatoid arthritis for fifteen years, and in whom a tap on the patellar or triceps-tendon not only elicited a greatly-increased reflex, but also caused spasmodic contraction of the muscles of the trunk. When the right arm was tapped, the left arm was always jerked, and such tapping gave rise to a clonic spasm extending over the whole body, which lasted over several minutes. I have myself met with somewhat similar phenomena in the case of a man, aged thirty-two, whose hands, shoulders, ankles, and knees were affected with rheumatoid arthritis. A tap upon either of the supinator tendons caused contraction of the corresponding triceps muscle; and when the triceps tendon was struck all the muscles of the arm, as well as those about the scapula, were thrown into contraction. The knee-jerks were greatly exaggerated, and some foot-clonus was obtained on the left side. There was great deformity of the affected parts, and the muscular atrophy was extreme.

Muscular Spasm.—With the increase of myotatic irritability is associated a tendency to spasm of the affected muscles, which may last for hours at a time, giving rise to most acute cramp-like pain, which the patients clearly distinguish from the articular and other pains from which they suffer. M. Gilbert Ballet has described two cases in which there was a species of clonic spasm; in one of which there were repeated supinations of the fore-arm, whilst in the other the masseters were the seats of clonic contractions. The spasms were not attended by any pain, they lasted a few minutes only, but they sometimes recurred as often as eight or ten times in the course of an hour.

Deformities.—The increased tonicity of the muscles is the cause of the grotesque distortions of the fingers and toes which are so commonly observed in the later stages of the disease, and the deformities so produced become in time permanent and irreducible owing to changes in the wasted muscles which lead to permanent shortening.

In some cases the distortion is so extreme that joints, which are not themselves the seats of disease, may be actually dislocated by the muscular contraction, and partial displacements of the heads of the bones are by no means uncommon. These muscular deformities are by no means peculiar to rheumatoid arthritis, being met with in the course of a number of lesions of the nervous system, apart from any disease of the joints, as well as in long standing articular disease of other kinds, such as chronic

gout, and the variety of chronic articular rheumatism, to which the name of "*rhumatisme fibreux*" was given by Jaccoud, who first described it.

Professor Charcot has accurately classified the deformities, arranging them under two main types, with several sub-varieties (figs. 13 and 14).

In cases which conform to the type of extension of Charcot:—

The terminal phalanges are flexed upon those of the second row at an obtuse, or even at a right angle.

The second phalanges are hyper-extended upon the first.

The first phalanges are flexed upon the metacarpal bones.

FIG. 12.—Hands of a Man aged Thirty-four, showing the Deformities of the Type of Extension.

The metacarpus and carpus are flexed upon the forearm at an obtuse angle (fig. 13, A).

In the first sub-variety of this type, the phalanges of the second row form a straight line with those of the first (fig. 13, B). In the second sub-variety the terminal phalanges are extended upon those of the second row (fig. 13, C).

In the cases conforming to the type of flexion:—

The terminal are extended upon the second phalanges.

The phalanges of the second row are flexed upon those of the first row.

The first phalanges are extended upon the metacarpals.

The metacarpus and carpus are flexed upon the forearm (fig. 14, D).

In the first sub-variety of the type of flexion, there is flexion of all the joints of the hand except the terminal joints (fig. 14, E). In the second sub-variety all the joints are flexed except those between the first and second phalanges (fig. 14, F).

It appears to me to be best to make the flexion or extension of the middle joints the basis of the classification, a plan which differs but little from that followed by Professor Charcot, and which merely necessitates the inclusion of the second sub-variety of the type of flexion as a variety of the type of extension.

Which kind of deformity is produced depends upon the relative strength of the different muscles, especially of the long flexors

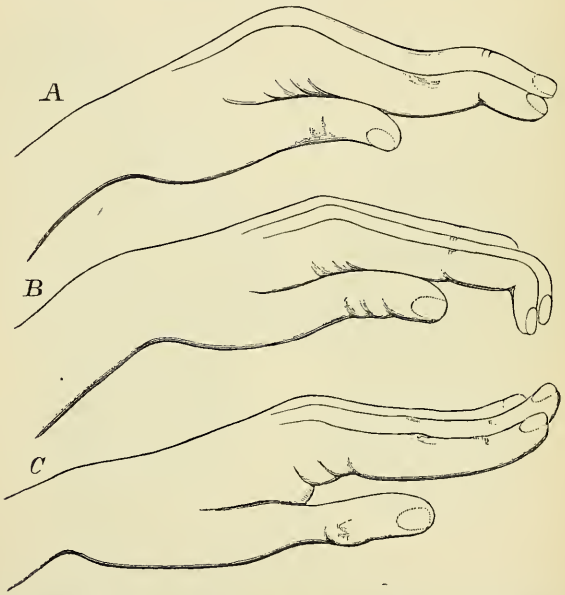

Fig. 13.—Types of Deformity of the Hand in Rheumatoid Arthritis (after Charcot). Type of Extension, and its Sub-varieties.

and extensors, and the interossei; and when it is considered that the interossei flex the first row of phalanges upon the metacarpal bones, and extend the second phalanges upon the first, it is seen how important a part these small muscles, which are so liable to atrophy, must play in this respect. When the interossei are strong, their spasmodic contraction will tend to produce the deformities of the type of extension; whereas, if they are weak, they will be overpowered by the other muscles, and extension of the phalanges upon the metacarpals and flexion of the middle joints will result. The muscular deformities are most pronounced in cases in which there is little osteophyte formation,

so that, as Charcot points out, the amount of distortion is to some extent inversely proportional to the enlargement of the heads of the bones.

I have had the opportunity of observing one case of rheumatoid arthritis in a patient who had suffered from an injury to the median nerve before the onset of the disease. The patient was a woman, aged forty-two, who had fallen while carrying a jug nine years before I saw her, and had inflicted a wound upon the

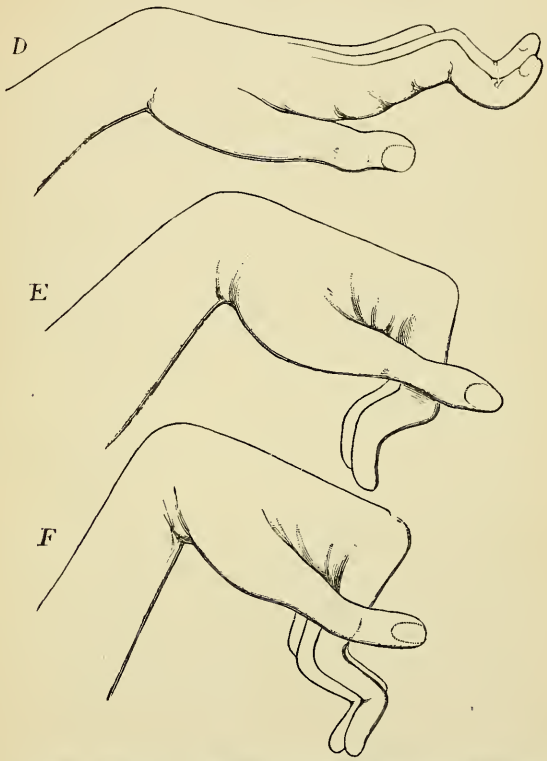

Fig. 14.—Types of Deformity of the Hand in Rheumatoid Arthritis (after Charcot). Type of Flexion, and its Sub-varieties.

flexor aspect of the right wrist. The rheumatoid arthritis had commenced four years after this accident, the hands being first attacked, and afterwards the knees and feet. Unfortunately the patient could not give any clear account of the condition of the fingers before the onset of the joint-affection; but when I saw her, the deformities of the two hands presented a remarkable contrast. The right thenar eminence presented much more extreme atrophy than the hypothenar; the mid-joints of the fingers were hyper-extended, and the terminal phalanges were

flexed at right angles to those of the second row. Some osteophytes were noticed, and one especially large one was situated near the metacarpo-phalangeal joint of the thumb. Ulnar deflection was well marked. The skin covering the fingers was glossy, but not pink. In the left hand there was much less rigidity, and the muscular atrophy was less marked. The middle joints of some of the fingers were enlarged, and there was merely some flexion of the middle and ring fingers.

I have also seen, in one instance, the association of the condition of dropped wrist with rheumatoid arthritis, in a patient who had suffered for ten years from pain and enlargement of joints. The end-joints of the fingers, and the carpo-metacarpal joints of the thumbs, exhibited osteophytic outgrowths; and the patient stated that she had suffered from pain in the right elbow some time previously, and from stiffness of the jaw. There was also crackling on movement in the left knee. She had been seized, two days before I saw her, with numbness and tingling in the right hand and arm, and had dropped an oil-can which she was carrying at the time. There was well-marked wrist-drop on the right side, but none on the left; the muscles of both hands, and especially the interossei, were atrophied. An electrical examination showed a diminution of faradic contractility in the muscles of both arms, which was more marked in the right. Faradic sensibility was diminished in the left arm. Galvanic contractility and sensibility were somewhat less in the left arm than in the right. KCC was everywhere greater than ACC.

Skin Changes.—Cutaneous dystrophy is by no means uncommon in connection with rheumatoid arthritis. The skin may present the typical glazed and pink appearance which is so conspicuous a result of nerve injuries, and to which the epithet "glossy" is usually applied; or it may be merely shiny without discoloration. Œdema of the subcutaneous tissues, especially of those of the legs, has been described by Vidal and Charcot, and I have myself more than once seen such œdema in cases of rheumatoid arthritis, in which none of the conditions which ordinarily give rise to anasarca could be detected. The nails may also exhibit dystrophic changes, becoming brittle and deeply ridged in the longitudinal direction. Some interesting cases of such dystrophic changes have been described by Dr. Hadden, who observed trophic ulcers upon the fingers in one instance. Wasting of the soft parts of the fingers is also often observed in cases in which there are such cutaneous changes as have been described. Dr. Hilton Fagge mentions among the rarer phenomena of rheumatoid

arthritis, the appearance of fibrous nodules at a distance from the joints, as for instance among the muscles of the arms or forearms, which must be distinguished from true rheumatic nodules. I am not aware that any other author has described these tumours.

Pain.—The articular pain of rheumatoid arthritis varies greatly in intensity in different cases, and in the same case from time to time; it usually has a gnawing character, and is aggravated by movement, and often by the warmth of bed. I have already spoken of the neuralgic pains, and those which result from muscular cramp, and to this list may be added a pain which is referred to the bones. Again, in rare instances, the onset of spondylitis gives rise to very severe radiating pains and to other symptoms of irritation or compression of the spinal nerve-roots, and such attacks must be carefully distinguished from primary sensory disturbances.

A remarkable case of this kind has been recorded by Professor Leyden. The patient was a man aged sixty-four, who was attacked in the night with sudden intense pain in the left thigh, and on the following morning he was unable to stand on account of the pain. During the following night he had cramps in the left leg, and when these had passed off there remained for some time a feeling of deadness in the limb. There was evidence of rheumatoid spondylitis of the lumbar spine.

In a case, for the opportunity of seeing which I am indebted to Dr. Andrew, in whose ward the patient was, I obtained the history of a somewhat similar attack. The patient, who was a young woman, aged twenty-four, stated that she was attacked in October 1835 with pain and swelling of the right wrist-joint, and soon afterwards the right foot, the knees, hands, shoulders, and temporo-maxillary joints became affected. One night, in October 1886, she was seized with severe pain, of an acute burning character, in the right arm, from the shoulder to the fingers. This pain, after lasting for about ten hours, ceased as suddenly as it had commenced; but she found that she had lost the use of the left arm, and had no feeling in it. Both power and sensation returned in about a fortnight; but from that time she suffered from pain along the spine, and from stiffness of the neck, and when I saw her a distinct grating was felt when the neck was rotated.

Visceral Lesions.—Hitherto I have spoken of rheumatoid arthritis as it affects the joints and the structures in their neighbourhood, and have made no reference to the question whether visceral lesions, similar to those which are met with in association with

articular rheumatism, are ever developed in its course. On this point wide differences of opinion exist. Professor Charcot has expressed the belief that endocarditis and pericarditis are sometimes developed in the course of polyarticular rheumatoid arthritis, but that they are less common, are less acute, and are attended by less serious results than are the cardiac lesions of rheumatic fever. In support of this view Professor Charcot has described some remarkable cases in which the evidences of recent endocarditis were discovered *post-mortem*, even although no murmur was heard during life. Besnier also states that all the visceral lesions of rheumatism may occur in the course of rheumatoid arthritis, but that they are infinitely rarer. Dr. Fuller did not mention cardiac affections among the complications of this disease, and in the third edition of his work he expressed a doubt whether cerebral inflammation and pleurisy, which he described in the earlier edition, were ever set up as a consequence of rheumatic gout. In the third edition of his work on "Gout and Rheumatic Gout," Sir A. Garrod also says: "I have never met with an instance in which I could trace the occurrence of pericarditis or endocarditis to rheumatoid arthritic disease, and I am of opinion that the absence of cardiac inflammation is one of the best tests for distinguishing this malady from genuine rheumatism." I believe that I express the views of the majority of English physicians when I say that the evidence which has been brought forward of the occurrence of actual visceral manifestations of rheumatoid arthritis is insufficient to carry conviction in face of the testimony of experience to the purely articular nature of the disease. Undoubtedly signs of valvular disease are not very uncommonly met with in patients suffering from rheumatoid arthritis; but when such are present, there is usually a history of a previous attack of rheumatic fever, and it must not be forgotten that rheumatoid arthritis may follow less severe rheumatic attacks. Excluding such cases, I do not think that cardiac lesions are more common among sufferers from this disease than amongst other persons who are advancing in life, and are therefore liable to atheromatous changes. At the same time it is necessary to weigh carefully the evidence supplied by the cases of Professor Charcot, whose opinion must carry great weight in this as in all other matters. It is, I think, an important fact that children who suffer from rheumatoid arthritis do not seem to be any more liable to visceral manifestations than are adults. Of the visceral lesions, other than endocarditis and pericarditis, which have been described, the majority are rather

of the nature of intercurrent disorders than of primary manifestations; I allude to bronchitis, interstitial nephritis, phthisis, and the like.

Sclerotitis, iritis, and conjunctivitis have been described as occasional complications; but in his third edition Dr. Fuller questions whether many, if not all, of the cases under his care in which these complications occurred were not examples of obscure gout or gonorrhœal arthritis. The deafness, which is not a very uncommon accident of the disease, is due to the extension of the morbid process to the ossicles of the ear; and my father is inclined to attribute the aphonia, which he has observed in many cases, to a similar affection of the arytenoid cartilages; but this view has not as yet received confirmation from laryngoscopic or *post-mortem* observations. Certain skin-affections have also been met with in a considerable number of cases, but not with such extreme frequency as to establish a causal relationship with the articular lesions. It has been suggested that if any cutaneous disease is especially associated with rheumatoid arthritis it is psoriasis. Besnier, however, doubts this connection.

General Symptoms.—When we turn to the general symptoms which accompany the development of rheumatoid arthritis, we find that these are comparatively insignificant. The patients are often in very poor health, a condition which is apparently rather a cause than an effect of the morbid process. The absolute deprivation of exercise, and, among the poor, of fresh air as well, which the disease, in its more severe forms, entails, cannot fail to have an injurious effect upon the general health, and to render the patient liable to the attacks of intercurrent disorders; but some sufferers survive for many years after they have become completely incapable of helping themselves.

The temperature-curve presents little interest in rheumatoid arthritis. In the more chronic forms of the disease, in which the degenerative changes are far more marked than the inflammatory, there is little or no elevation of temperature at any time; but in the more acute cases slight febrile disturbance is usually present, which is quite irregular in type, and is usually not maintained for any length of time.

In the urine, Dr. Angel Money has observed excessive variations in the amount of urea and uric acid excreted, and in some instances transitory glycosuria. Drachmann has noted a diminution of the amount of phosphates in the urine of sufferers from rheumatoid arthritis.

The disease itself has no fatal tendency, unless by producing

spinal lesions secondary to spondylitis, and even patients whose jaws have been completely closed by arthritis of the temporo-maxillary joints have lived for years upon liquid nourishment administered through gaps in the teeth. Death results from the development of intercurrent diseases of various kinds, among which phthisis and renal affections may be specially mentioned. In the *post-mortem* examinations of which he mentions the results, disease of the bladder or kidneys was found in almost every case, and among the other lesions which caused death were cerebral hæmorrhage, bed-sores, pulmonary tuberculosis, and phlegmon.

Under treatment the disease may often be entirely arrested, especially if the case is taken in time; and in the early stages very considerable enlargement of the joints may disappear. In some cases the malady ceases without treatment, but more commonly it steadily advances, sometimes in spite of treatment, until almost all the joints have been invaded in turn; but when the destruction of the cartilage is complete, the patient may attain to a more comfortable condition, and the usefulness of the joints may be to some extent recovered, owing to the free movement of the eburnated bony surfaces upon each other.

CHAPTER V.

HEBERDEN'S NODES.

Heberden's description—Nature of the nodes—Their relation to gout and to cancer.

"I HAVE never clearly understood," wrote Heberden in 1805, "the nature of the small tumours, about the size of a pea, which sometimes form near the third joints of the fingers; they have certainly nothing in common with gout, for they are found in many patients who have no experience of that disease. They last through life, are painless, and have no tendency to ulcerate. They are rather disfiguring than inconvenient, although the movements of the fingers are somewhat hindered by them."

The passage here quoted is the earliest reference to the small outgrowths therein described, which have consequently been known ever since as Heberden's nodes. They may be regarded as constituting the very slightest and most chronic manifestations of rheumatoid arthritis, a sub-variety of the polyarticular form rather than a distinct type. Although often met with as isolated phenomena, they are often associated with affections of other joints, and sometimes accompany the localised rheumatoid affection of the hip or shoulder.

The formation of the nodes is due to an osteophytic enlargement of the nodules of bone which are normally present in the situations in which they appear, and as Professor Charcot and others have shown, they are attended by the characteristic rheumatoid changes in the adjacent joint-structures. Not infrequently a small cystic swelling is present at the summit of each node, which, if punctured, discharges a clear viscid fluid, and which is seen to be translucent when looked at by transmitted light. They are probably of the nature of herniæ of the synovial capsules of the joints, such as are often met with in other situations. The radial deflection of the terminal phalanges which is frequently seen in cases of generalised rheumatoid arthritis, is sometimes

present when the end-joints alone suffer, but in such cases the joint has usually suffered severely, and the two nodular swellings are lost in the general enlargement of the heads of the bones. Similar nodes are sometimes seen upon the dorsal aspects of the middle joints of the fingers in cases of polyarticular rheumatoid arthritis of a very slight and chronic kind, being produced by the enlargement of the tubercles present in these situations also. I have frequently noticed that the terminal joints of the thumbs escape when those of the fingers are the seats of the nodular swellings.

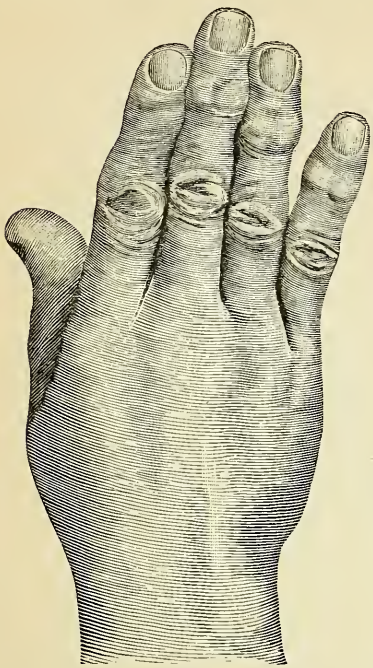

Fig. 15.—Heberden's Nodes (from a Cast in the Museum of St. Bartholomew's Hospital).

Heberden's nodes are seldom attended by any considerable amount of pain, but there may be considerable limitation of the movements of the affected joints. Often the patients are more concerned on account of the disfigurement that they produce, than for any discomfort that they cause.

It has often been questioned whether Heberden's nodes are in reality of the nature of rheumatoid arthritis, or whether they are not rather manifestations of a gouty diathesis. We have seen that Heberden had formed a very definite opinion upon this point; but Dr. Begbie leant to the opposite view, and believed that they are sometimes of a truly gouty nature. All are, I think, agreed that they have no necessary connection with gout; but Sir Dyce Duckworth states his conviction that among the cases referred to this condition there are some which are of an undoubtedly gouty nature, and adds that in women they often co-exist with hemicrania, asthma, and other less typical gouty troubles. I may add that I have myself seen such nodes in cases in which there were clear histories of gout, but of no other articular affection. Professor Charcot has also called attention to their not infrequent association with cancer, and especially with cancer of the uterus. In many instances the formation of these nodes appears to be of the nature of a senile change.

CHAPTER VI.

SECONDARY RHEUMATOID ARTHRITIS.

Rheumatoid arthritis as a sequela of rheumatism—Relation of the distribution of the rheumatoid to that of the earlier rheumatic lesions—Examples—Cardiac lesions not uncommon in post-rheumatic cases—Rheumatoid arthritis following gonorrhœal arthritis—Example—Rheumatoid changes in gouty joints.

Post-Rheumatic Form.—The cases in which rheumatoid arthritis develops as a sequela of an acute attack of rheumatic fever exactly resemble those in which it has the characters of a primary disease; and if it be denied that the rheumatoid changes are merely due to the continued activity of the rheumatic process, it is necessary to offer some alternative explanation of the occurrence of these post-rheumatic cases. The explanation which I would offer is that the articular changes of rheumatoid arthritis are merely of a dystrophic character, and that a disturbance of the nutrition of the joints may ensue as the result of an acute arthritis of any kind. If this explanation is the true one, we should expect to find that the osteo-arthritic changes are in these post-rheumatic cases limited to those articulations which have been the seats of the antecedent acute inflammation, and that post-rheumatic rheumatoid arthritis is only polyarticular because the original acute lesions affected many joints. Even if this were proved not to be the case it would not entirely negative the above view, for, as Mr. M'Ardle has shown, the disease, even when it originates in a single joint as the result of an injury, may become generalised.

To prove whether or no the later rheumatoid lesions correspond in distribution with those of the previous rheumatism is no easy task, for in the majority of instances we have only the patient's own account to go upon, and in a matter of this kind his memory may easily play him false. Indeed, it would only be possible to arrive at a satisfactory solution of the question by comparing the

distribution of the lesions with the records contained in clinical notes kept during the attack of rheumatic fever. I have frequently made inquiries of patients suffering from post-rheumatic rheumatoid arthritis, with a view to obtaining some information upon this point, and I am able to state that in no such case, in which the hands exhibited the characteristic rheumatoid lesions, have I failed to obtain a history of affection of these parts during the acute rheumatic attack; but whether this observation will bear the test of still further inquiries remains to be seen.

The following cases are examples of post-rheumatic rheumatoid arthritis. A man aged thirty-eight, who gave no family history of gout or rheumatism, had suffered from rheumatic fever three times in the course of three years, was laid up in bed each time, and sweated profusely. Since the last attack he had been troubled with stiffness in the joints of the arms and legs, and by swelling of the knees and ankles. When seen the ankles were somewhat swollen, and there was well-marked synovial crackling in them on movement, but the heads of the bones were not enlarged. There was some osteophytic enlargement of the right elbow as well as of the middle joints of several of the fingers, especially the ring finger of the left hand. The heart-sounds were normal. The neck and jaw had escaped. A woman aged thirty-four, with no rheumatic family history, had suffered from rheumatic fever at eleven years old, and also at eighteen and twenty-four; and in the period since the last attack of rheumatic fever, had suffered from three fairly severe articular attacks. Since the last of these she had noticed enlargement of the finger-joints, which presented the appearance typical of rheumatoid arthritis. The fingers were deflected to the ulnar side. The knees, feet, ankles, wrists, shoulders, elbows, were all more or less involved. She complained of pain in the lower part of the back, but the neck and jaw had escaped. The patient was a married woman who had had six children, one of whom had been under my care with heart-disease. The patient herself suffered from heart-disease, having a loud systolic apex murmur. A boy aged thirteen, who had suffered from rheumatic fever eighteen months previously, was admitted to St. Bartholomew's Hospital under Dr. Andrew's care. Five weeks before his admission his shoulder-joints became painful, and afterwards the ankles, wrists, and hands. The pain was never very severe. The wrists were much swollen, and their capsules distended with fluid. The middle joints of the fingers of the right hand were enlarged as in rheumatoid arthritis; the right knee was also

swollen, and osteophytic enlargement was found; the patella was lipped. The ankles and left great toe were also involved. The fingers of the right hand were not deflected to the ulnar side, but the interossei were much wasted. There was some slight stiffness of the neck. The area of cardiac dulness was increased, and a systolic apical murmur, clearly organic, was present. The temperature was usually raised to about 100° in the evening.

In one respect the post-rheumatic cases differ from those of the ordinary polyarticular variety, namely, in the frequent presence of lesions of the cardiac valves, which afford important evidence of the truly rheumatic nature of the antecedent attack. In their other characters, such as the atrophy of the neighbouring muscles, the increase of myotatic irritability, and the resulting deformities, the two varieties present the closest resemblance to each other.

Post-Gonorrhœal Form.—I have myself seen more than one case in which the typical osteo-arthritic lesions were dated from attacks of gonorrhœal arthritis, and these cases constitute another sub-variety of the secondary form of the disease. In considering cases of this kind it must be borne in mind that a high degree of immobility of the affected joints, and considerable deformity, may result from the more chronic forms of gonorrhœal arthritis apart from any development of osteophytic outgrowths. A man, aged twenty-one, came under my care with typical rheumatoid arthritis of the metatarso-phalangeal joint of the left great toe, and of the terminal joint of the left middle finger, with considerable effusion into the right knee. The patient said that rather more than a year previously he had suffered from gonorrhœa, and two months later there had been pain and swelling of the three joints which were the seats of the rheumatoid change. The patient's mother had suffered from rheumatic fever, but he himself had not. His heart-sounds were natural. In this case there is, of course, room for doubt whether the original articular trouble was really gonorrhœal arthritis, but that it was so is strongly suggested by the small number of the lesions, and the complete want of symmetry in their distribution. Professor Charcot states that chronic rheumatism, with deformity of the joints, may follow an attack of gonorrhœal arthritis. Lorain has recorded cases of post-gonorrhœal rheumatoid arthritis under the name of "*Rhumatisme blenorrhagique à forme noueuse.*" In one of his cases the patient was a man, aged thirty-two, who, in the course of a second attack of gonorrhœal arthritis, suffered from affection of the feet, knees, hands, and sterno-clavicular

joints. Later his fingers became deflected to the ulnar side, and the knuckles and phalangeal joints became enlarged and deformed. Sir Alfred Garrod also says: "I have known several cases exhibiting all the characters of rheumatoid arthritis, apparently arising from that form of rheumatism which is associated with urethral inflammation." These cases are naturally rarer than those of the post-rheumatic kind, because gonorrhœal arthritis is less common than rheumatism, and is especially frequent in men, who exhibit comparatively little tendency to rheumatoid arthritis.

In Gouty Joints.—It is a matter of common observation that osteophyte formation and destruction of cartilage may result from repeated attacks of gout in a joint, and Mr. Hutchinson quotes such cases in support of his contention that rheumatoid arthritis is often the outcome of an admixture of gout and rheumatism. These cases I would class as yet a third sub-variety of secondary rheumatoid arthritis. In his work on gout, Sir Dyce Duckworth takes a different view of these cases, and says: "I believe that, for the majority of articular deformities and distortions met with in uratic arthritis, gout is solely responsible, and that many of the changes thus wrought are similar to, but not the same as, those induced by rheumatic disease. The evidence as to *causation* is not afforded by a study alone of the *results* of either disease." Of differences which exist between the lipping of rheumatoid arthritis and that of gout, I shall have occasion to speak later.

This view seems to me to be perfectly consistent with the view I have stated above, for, in speaking of these changes as examples of secondary rheumatoid arthritis, I do not imply the admixture of any second and distinct disease, but merely state my belief that joints which have been the seats of rheumatism, gonorrhœal arthritis, or gout, may undergo in certain cases dystrophic changes, similar to those which are more commonly developed in joints which have not been the seats of any antecedent acute arthritis. In a word, I would maintain that although the changes observed in the joints are the same in all varieties of rheumatoid arthritis, their causation, and the mechanism by which they are produced, is different in each.

The subject of secondary rheumatoid arthritis, which has here been so very inadequately sketched, is still in its infancy; and it is one which demands, and will, I am sure, repay further investigation.

CHAPTER VII.

LOCALISED RHEUMATOID ARTHRITIS.

Clinical differences between the localised and polyarticular varieties—Localised rheumatoid arthritis often dates from an injury—Rheumatoid arthritis of the hip—Clinical features—Cysts in connection with this disease—The disease may become generalised—Localised affections of other joints.

The monarticular variety of rheumatoid arthritis, of which the hip-joint disease of elderly people is the most typical example, although leading to identical articular changes, is widely different in its clinical aspects from the polyarticular variety. The tendency to peripheral invasion which is so conspicuous in the polyarticular form is entirely absent, and indeed the joints which suffer are chiefly those which are nearest to the trunk. Nor is there any marked tendency to symmetry, although in some cases the second hip or shoulder is affected in a minor degree. Another most conspicuous difference is in the incidence of the disease upon the sexes, for the victims of the localised affection are more often men than women.

It is difficult to reconcile these differences with the view that rheumatoid arthritis is a definite disease, of rheumatic or other nature, of which the polyarticular and monarticular forms are merely sub-varieties, and they tend to support the view that the characters of the articular changes are the only points which the conditions grouped under this name have in common with each other.

Monarticular rheumatoid arthritis often dates from a local injury, either to the joint itself or to the neighbouring structures, and previous to the labours of Adams and his contemporaries the symptoms to which it gives rise were usually referred to fractures. In old people especially a very slight injury is sufficient to set up what may almost be looked upon as a senile change.

Berger has shown that fracture of a long bone may be followed

by inflammation of a neighbouring joint which has escaped direct injury, and this, taken in conjunction with the fact that injury to a joint may be followed by atrophy of the neighbouring structures, seems to point to some interdependence of the joints and the neighbouring parts, so that injury to the one is followed by a reflex dystrophy of the other. And in this interdependence may perhaps lie the explanation of those cases in which rheumatoid arthritis of a joint follows damage to the soft parts in its neighbourhood.

Dr. Adams at first proposed for rheumatoid arthritis of the hip the name of "malum coxæ senile;" but finding that it occurred in middle life as well as in old age, he substituted later that of chronic rheumatic arthritis. In his investigations of this subject he was ably seconded by several other distinguished Irish surgeons, Robert Smith, Colles, and Wilmot; and the similar changes which occur in the shoulder-joint were described by Canton of London.

The earliest symptom complained of by the patient is usually some pain, of a gnawing character, in the hip-joint, attended by some limitation of its movements; and, as in the other varieties of hip-disease, the pain is usually referred to the knee also. The pain gradually increases in severity, and the stiffness becomes more and more marked, yet the patient is usually able to get about, and to support himself upon the leg, since the pain is not increased, to any great extent, by pressure upon the acetabulum. The limitation of movement is well brought out when an attempt is made to cross the affected leg over the sound one, an action which the patient is, as a rule, unable to perform without the aid of his hands; and there is usually inability to perform any movement of rotation of the leg. As in the generalised form of the disease, the muscles which move the affected joint undergo considerable atrophy, as is shown by the flattening of the gluteal region, and the abolition of the fold; and in most cases there is some wasting of the muscles of the thigh. The knee-jerk is usually increased upon the affected side, and often to some extent upon the sound side also. As the disease advances, the destruction of the head of the femur and the flattening of the acetabulum leads to very considerable shortening of the leg; but Dr. Adams points out that this shortening is not really so great as it appears, being increased by inclination of the pelvis.

In some instances cysts of very great size are developed, often at a considerable distance from the joint, and having no apparent

connection with it. Mr. Morrant Baker, to whom we owe the earliest description of these cysts, has also found them in connection with other joints, such as the shoulder, elbow, wrist, knee, and ankle. The relation of these to the ordinary bursal enlargements, which are so common, may be compared to that of a false to a true aneurism. Mr. Baker believes "that the synovial fluid, on reaching a certain amount of tension by accumulation within the joint, finds its way out in the direction of least resistance, either by the channel by which some normal bursa communicates with the joint, or, in the absence of any such channel, by forming first a hernia of the synovial membrane. In both cases, should the tension continue or increase, the fluid at length escapes from the sac, and its boundaries are formed only by the muscles and other tissues between and among which it accumulates." It is often impossible to make out any communication between the cyst and the joint during life, but it is unsafe to conclude from this that no communication exists.

Sciatica is the affection which is most liable to be mistaken for arthritis of the hip-joint, but a diagnosis may usually be made from the difference in the character and distribution of the pain, and the absence of any obvious limitation of the movements of the joint. It sometimes happens that the disease, beginning in the hip-joint, afterwards attacks the fingers and other parts; but such cases, which are exceptional, may be compared to those in which the disease becomes developed after an injury to a single peripheral joint.

Other articulations besides the hip may become the seat of the monarticular form of rheumatoid arthritis, and it is curious that the larger and more central joints, such as the shoulder and knee, appear to be especially liable. When the shoulder is affected, there is similar gnawing pain, limitation of the movement, and atrophy of the neighbouring muscles, whilst in the knee and other more superficial joints the obvious changes which are characteristic of the disease may be readily made out. In all, the peculiar grating of the denuded surfaces of the bones can usually be detected.

The earlier descriptions of the morbid anatomy of rheumatoid arthritis were chiefly drawn from cases of the monarticular variety, which present changes identical with those met with in the generalised form.

CHAPTER VIII.

MORBID ANATOMY.

The changes in the joints partly inflammatory and partly degenerative — Senile changes in joints—Lesions of the articular cartilages—Microscopical changes—Cornil and Ranvier—The formation of ecchondroses—Osteophytes—Wynne on gouty lipping—Eburnation of bone—Changes in the bones—Changes in soft parts—Loose bodies—Synovial effusion—Hoppe Seyler's analysis of the articular fluid—Changes in muscles—Peripheral neuritis—Secondary changes in spinal cord—Endocarditis and pericarditis.

THE changes which are observed *post-mortem* in joints which have been the seats of rheumatoid arthritis have been very carefully studied by a number of observers both in this country and upon the Continent, and widely different views have been expressed as to the nature of these changes. Neither Colles nor Robert Todd were inclined to look upon the articular lesions as inflammatory, and the latter attributed them to an abnormality of nutrition. Dr. Adams, on the other hand, held strongly that they were truly inflammatory. It is probable that both views were more or less true, and that Senator is right when he says: "The changes in the joints are partly inflammatory, partly degenerative." The effusion of fluid into the synovial capsule, the occasional heat of the joints, the vivid injection of the synovial membrane, and the fever which attends the disease in its more acute forms, all point to the element of inflammation in the lesions, whilst the degenerative or nutritional changes are most clearly exhibited by the articular cartilages and the bones. Which is the primary event, the inflammatory or the nutritional change, is not yet known for certain. Brodie, Adams, and others have described the affection of the synovial membrane as the primary event, and Volkmann expressed his belief that the changes in the cartilage are usually preceded by a chronic synovitis. Drs. Wilks and Moxon consider that the erosion of cartilage has been given undue prominence, since such erosion is common in old people apart altogether from other evidence of

rheumatoid arthritis. My own belief is that the fibrillation of cartilage is the primary event, and I hold with those who think that the inflammatory changes in the synovial membranes and capsules of the joints are secondary processes. Rheumatoid arthritis is so little fatal that opportunities are comparatively rarely afforded of observing the condition of the joints in the earlier stages of the disease, and consequently the final solution of this important question is a matter of considerable difficulty.

The senile changes which are met with in joints, and which have been so carefully studied by Weichselbaum, closely resemble those produced by rheumatoid arthritis, but are much slighter in degree; and, as I have already said, the most chronic form of the disease, which gives rise to little or no pain and comparatively trifling inconvenience, is probably in many instances simply a senile change.

Changes in the Cartilages. — Whether or no the articular cartilages are the primary seats of the disease, they certainly suffer at a very early period of its course. To the naked eye the diseased cartilage presents an appearance which has been aptly compared to that of velvet—an appearance which is due to the breaking up of the ground-substance into delicate fibrillæ, whilst the cells are removed. Around the edges of the cartilage a heaping up or lipping is observed. As the disease advances, the central areas of the fibrillated cartilage become worn away, and ultimately the heads of the bones may be left completely bared. In joints such as the temporo-maxillary, in which there is an intra-articular cartilage, this also becomes absorbed, and the semilunar cartilages of the knee may entirely disappear.

MM. Cornil and Ranvier describe a multiplication of the cartilage cells throughout the entire depth of the articular cartilage, and the formation of capsules around some of them. In the enlarged primitive capsules large numbers of secondary capsules are contained, which may either be enclosed by a common envelope, or may be independent of each other. Cornil and Ranvier state that previous observers have mistaken these capsules for true cartilage cells, but that the incorrectness of this view may be demonstrated by staining them with iodine, which colours the protoplasm of the cells brown, whereas it leaves the secondary capsules unstained or merely tinted. They observed that the superficial primitive capsules assume a globular form, and, becoming distended, burst, emptying their contents into the cavity of the joint. (Fig. 16.). Since the capsules of the second row, and those which are still more deeply seated, can only grow in a direction perpendicular to

the surface of the cartilage, they open into each other, forming parallel tubules. Cornil and Ranvier further describe how the swollen primitive capsules gradually discharge their contents into the articular cavity, leaving the tubules empty, whilst the ground-substance lying between the tubules becomes separated into filaments, which give to the cartilage its fibrillated appearance. Rindfleisch states that the mechanical destruction of the filaments is accelerated by their undergoing mucous degeneration, a change which may account for the large quantity of mucin which was detected by Hoppe Seyler in the articular fluid.

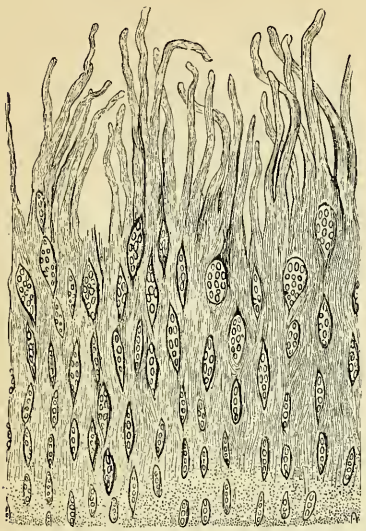

FIG. 16.—Section of Cartilage, showing Fibrillation resulting from Rheumatoid Arthritis.

The proliferation of the cartilage at its margin results, first, in the formation of a lip, and ultimately leads to the development of osteophytes. MM. Cornil and Ranvier ascribe this marginal overgrowth to the fact that the edges of the articular cartilages are overlapped by a layer of synovial membrane, which prevents the escape of the cellular elements into the cavity of the joint; and the accumulation of these cellular elements under the synovial membrane is regarded by them as leading to the formation of ecchondroses. The ecchondroses ultimately become converted into bone, the change commencing, as Volkmann showed, in the layer nearest to the original bone. When ossification is far advanced, the osteophytes still remain covered by a cartilaginous layer.

Changes in the Bones.—Dr. E. T. Wynne has recently called attention to the fact that the lipping which is observed in many cases of gout is the result of a different process to that which causes the heaping up of the cartilage in rheumatoid arthritis. He finds that in gouty lipping, the cartilaginous covering stops short at the summit of the outgrowth, and that the remainder of the lip is covered by a dense layer of fibrous tissue continuous with the periosteum and synovial membrane. Dr. Wynne describes the outgrowth in such cases as presenting the appearance of a sprouting of the cancellous tissue of the epiphysis, which carries the cartilage before it; in other words, of a true exostosis.

The bone left bare by the removal of the cartilage has a thin superficial layer of extreme density, and from its resemblance to ivory it is said to be eburnated. The polished surface may present minute perforations from the laying open of Haversian spaces. The formation of this dense layer has been explained in various ways. Ziegler states that whilst the superficial layer of the cartilage is becoming fibrillated, a softening process is going on in the deeper layers, which leads to the formation of cavities, which become filled sooner or later with vascular medullary substance, which grows into them from the bone, and leads to ossification. Cornil and Ranvier, on the other hand, attribute the eburnation to the discharge into the adjacent medullary spaces of the contents of the most deeply seated cartilage capsules, which, as they enlarge, cause the intervening bone to be absorbed. This discharge of the capsules leads, according to these observers, to the formation of a thin layer of compact bone. In some cases, however, they are inclined to attribute the change to the extension of inflammation to the most superficial layer of the cancellous tissue. Others regard such a local osteitis as the chief agent at work in the production of eburnation; and others, again, attribute the condensation to purely mechanical influences. The friction of the exposed bony surfaces upon each other leads to the formation of grooves or striæ in the direction of their movement, and at a later stage there may be still more conspicuous loss of bony substance, which may result in a complete alteration of the mechanism of the joint. This is well shown in fig. 17, which represents a shoulder-joint which has undergone a most remarkable modification, the convex boss, which occupies the position of the glenoid cavity, fitting into an excavated cup upon the upper extremity of the humerus. The same figure shows the osteophytic outgrowths around the newly formed cavity. As a result of this combined process of destruction and outgrowth, the heads of the bones often present a mushroom-like appearance, such as Volkmann described, and, as he points out, convey the impression that they have been moulded while in a softened state. When the osteophytes attain to a considerable size, they may so interlock or obstruct each other as to destroy entirely the mobility of the joint, but it is a remarkable fact that true bony ankylosis of the opposed surfaces, which is by no means rare as a result of chronic gout, is never met with in rheumatoid arthritis, except, as Bowlby has pointed out, in the spinal column.

The bony structure of the epiphyses is usually somewhat altered, and Volkmann suggested that possibly there was at first

a rarefying osteitis and later an osteosclerosis. That the wasting of the bone is not purely mechanical he considered as proved by the fact that it sometimes goes on in parts protected by cartilage. Broca described the changes in the bones as limited to the epiphyses, but Adams observed in some cases hypertrophy of the shafts and increased density of its structure. In cases in which rheumatoid arthritis is of the nature of a senile change, the bones are apt to be rarefied rather than condensed, and the interstices of the cancellous tissue contain large quantities of fatty substance.

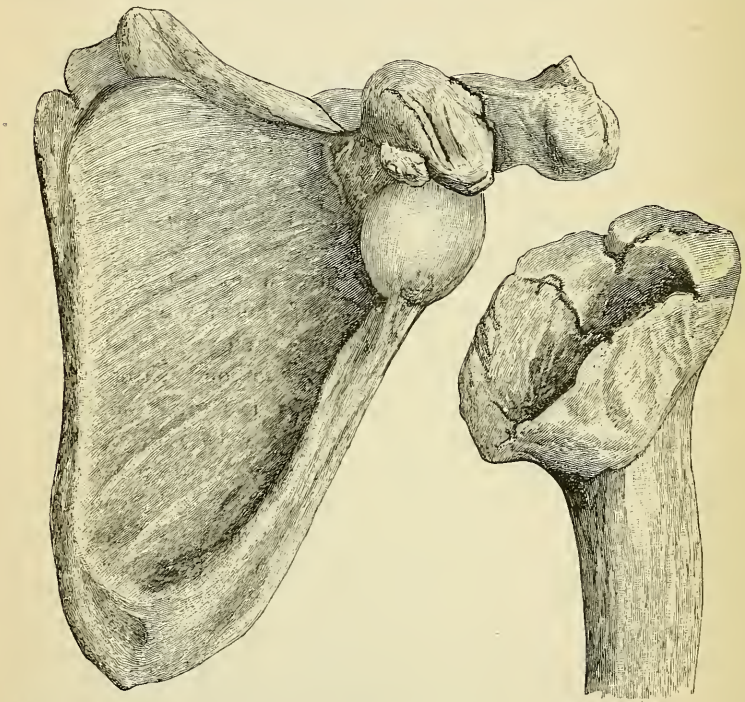

Fig. 17.—Scapula, and Head of Humerus, showing Reversal of the Mechanism of the Joint, due to Rheumatoid Arthritis, and Extensive Osteophytic Outgrowths upon the Humerus. (From a specimen in the Museum of St. Bartholomew's Hospital.)

Changes in the Synovial Membrane.—When a joint which is the seat of rheumatoid arthritis is opened in the course of a surgical operation, vivid injection of the synovial membrane is one of the most striking appearances observed. As the disease progresses, the synovial membrane and the fibrous capsule become greatly thickened; the synovial fringes are hypertrophied, so that they form tufts, which may undergo fatty changes, or may contain cartilaginous masses. MM. Cornil and Ranvier attribute the formation of cartilage in the synovial fringes to the replace-

ment of the fat which they contain by embryonic cells, from some of which cartilage is formed, from others fibrous tissue. The pedicles which fasten these particles of cartilage to the synovial membrane are apt to become stretched, and ultimately to rupture, and in this manner loose bodies are formed which lie free in the cavity of the joint. Loose cartilages may also be present in the bursæ which lie in the neighbourhood of the diseased joint, and I have repeatedly found them in the bursa over the olecranon.

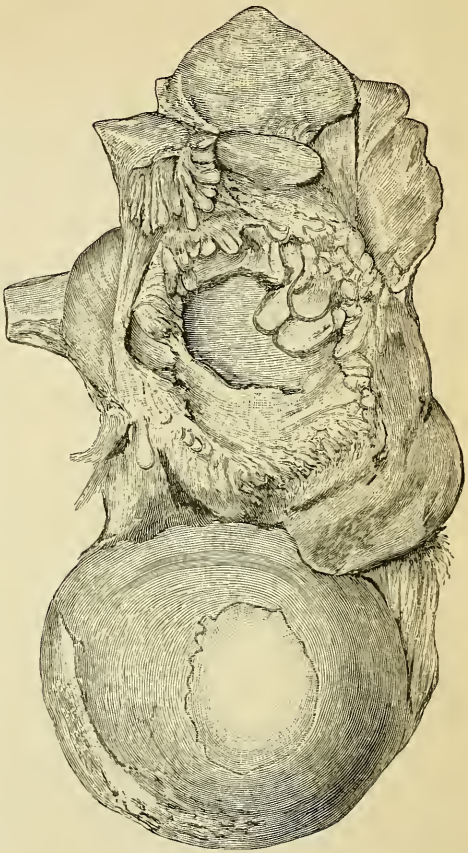

FIG. 18.—Shoulder-Joint which has been the Seat of Rheumatoid Arthritis, showing destruction of Cartilage, and Synovial Fringes. (From a specimen in the Museum of St. Bartholomew's Hospital.)

Ligaments which are contained in, or pass through, the diseased joints become absorbed, as is well seen in the case of the ligamentum teres when the hip-joint is affected, and of the long tendon of the biceps when the shoulder suffers.

I must express entire disagreement from those observers who state that there is seldom or never effusion into the synovial capsule in rheumatoid arthritis, and I believe that arthritis sicca is an entirely erroneous designation for the disease. In some instances the distension of the synovial capsule is very considerable, and may be in the early stages the only objective sign of the disease. This is especially the case in the knees, in which fluctuation and riding of the patella may often be elicited. This liability to synovial effusion has long been recognised by British observers, and is insisted upon alike by Brodie, Adams, Fuller, Garrod, and many others. Besnier, on the other hand, speaks of this form of joint-disease as unattended by any appreciable effusion; Senator

says that the fluid contents of the articular cavity are almost always diminished, and that sometimes the joints contain no fluid at all; and Homolle goes so far as to question whether the fluid analysed by Hoppe Seyler could have been obtained from cases of rheumatoid arthritis. It is impossible to reconcile such diametrically opposed statements, and one must be content to state that, in this country at least, synovial effusion is often one of the most conspicuous phenomena of rheumatoid arthritis.

Hoppe Seyler's analysis of the articular fluid gave the following results:—

Mucin	28.19	per thousand.
Albuminous substances	20.92	„
Ethereal extract	.93	„
Alcoholic extract	1.30	„
Watery extract	.65	„
Acetic extract	1.53	„
Inorganic substances	8.79	„
Total solids	57.28	„
Water	942.72	„

The ethereal extract was found to contain cholesterin, lecethin, and traces of fat.

Dr. Hilton Fagge mentions that in one instance Dr. Goodhart found an effusion of blood into a rheumatoid arthritic joint. In the later stages the effusion may be almost entirely absorbed. It is common to see the bursæ in the neighbourhood of the affected joints distended with fluid, and the swellings so produced may add materially to the deformity which is produced by the disease. Of the enormous cysts which are occasionally produced by the extravasation of fluid into the neighbouring tissues, I have already spoken.

Changes in the Muscles.—The muscles exhibit well-marked atrophy, and have a colour which Debove has compared to that of dead leaves. Debove has shown that the muscular fibres do not all suffer alike, some being much more degenerated than others, a character by which muscular atrophy resulting from nervous influences is distinguished from idiopathic wasting.

Peripheral Neuritis.—MM. Pitres and Vaillard have found well-marked neuritis of the peripheral nerves in several cases which they have examined. These observers believe that there is a constant relation between the presence of neuritis and the development of trophic changes in the muscles and skin.

In one of the cases described by these observers, in which the

atrophy of the muscles of the legs was conspicuous, the nerves which supplied the wasted muscles were found to be profoundly affected, whereas, in a second case in which the muscular atrophy was trifling, the muscular nerves exhibited no changes. In the nerves which supplied the affected articulations MM. Pitres and Vaillard found but little evidence of disease, and they express the opinion that the lesions of the peripheral nerves cannot be regarded as the actual causes of the joint-lesions. In some instances secondary changes in the cord and nerve-roots have been found *post-mortem* in cases in which the spinal column has been attacked by rheumatoid arthritis, and a good observation of this kind has been placed on record by Rotter, who found some degeneration of the spinal cord in connection with disease of the occipito-atlantal joint, and slight spondylitis of the cervical spine.

No primary lesions of the spinal cord have been discovered to which the development of rheumatoid arthritis could be ascribed.

Visceral Lesions.—Such visceral lesions as are found *post-mortem* may, with a few possible exceptions, be ascribed to intercurrent diseases, which have caused the patient's death. Among these, pulmonary tuberculosis has been assigned an important place by some observers, and chronic interstitial nephritis is not uncommon. It is necessary to refer again in this place to the lesions of the endocardium and pericardium which have been described by MM. Charcot and Cornil. Such lesions are admittedly very rare, except in cases in which the history of an antecedent attack of rheumatic fever is obtained; but it must not be forgotten that as life advances the liability to cardiac accidents, even in the course of rheumatic fever, is far less than in early life. In considering cases in which endocarditis and pericarditis are apparently developed in the course of primary rheumatoid arthritis, two important facts must be borne in mind. In the first place, valvular disease in later life frequently results from atheromatous processes; and, secondly, pericarditis is an important complication of chronic renal disease. In the cases observed by Charcot, in which evidences of recent endocardial disease were present in sufferers from rheumatoid arthritis who gave no rheumatic history, sometimes the aortic and sometimes the mitral valves suffered. The valves were found to be thickened, hardened, and opaque; they were vascular, and presented small vegetations upon their surfaces. Occasionally the form and size of the valves had been so little altered by the morbid process that no murmur was heard during life. M. Charcot

has also observed pericarditis in several instances, and M. Cornil quotes two instances in which this lesion was developed shortly before death. In one of Cornil's cases the onset of pericarditis was associated with the formation of a large abscess in the leg, but the pericardial fluid was not purulent; in the second case the patient had previously suffered from rheumatism, and had chronic renal disease.

CHAPTER IX.

THE PATHOLOGY OF RHEUMATOID ARTHRITIS.

The rheumatic view—Views of Mr. Jonathan Hutchinson—Of Dr. Fuller—Of Mr. Arbuthnot Lane—The dystrophic theory—Views of Dr. Ord, Professor Senator, Sir Dyce Duckworth, and others — The argument from the character of the articular lesions — The argument from the distribution of the lesions — The argument from ætiology—The argument from treatment—The argument from associated dystrophic changes—Such changes, for the most part, secondary to the joint-lesions—Peripheral neuritis in rheumatoid arthritis.

In discussing the pathology of rheumatoid arthritis, the first question to be considered is whether or no this disease is merely a variety of chronic rheumatism, as has been supposed by many observers, and as it is usually described by French writers upon the subject.

Many facts which have been dwelt upon in the preceding chapters are opposed to the rheumatic view, and almost the only arguments which can be brought forward in its favour are based upon the occasional development of rheumatoid arthritis as a sequela of acute rheumatism, and the importance of cold and damp as causes of the disease. Of course, if it be granted that cardiac lesions are developed in the course of rheumatoid arthritis, just as they are in acute rheumatism, and are only less frequent and less severe in consequence of the greater chronicity of the morbid process and the more advanced age of the patients, a far more potent argument is forthcoming; but although it has been shown that such lesions are present in some cases, and are sometimes developed in its course, I am by no means convinced that this is sufficiently often the case to warrant the conclusion that rheumatoid arthritis is the actual cause of such lesions, or rather that both the articular and cardiac damage are the results of the same morbid process. Nevertheless a view which has the support of so eminent an authority as Professor Charcot cannot be lightly set aside.

In the great majority of cases rheumatoid arthritis originates as a primary disease independently of any previous rheumatic attack, and against the undoubted fact that it is sometimes developed as a sequela of acute rheumatism must be set the fact that it may follow other kinds of acute arthritis also. The causes which favour the development of rheumatoid arthritis are, for the most part, different from those which precede rheumatism, although exposure has a share in the causation of both maladies. The remarkable liability of the female sex to rheumatoid arthritis offers another distinctive character, for in adult life rheumatism is, if anything, commoner in men than in women. Whereas rheumatism is essentially a disease of early life, rheumatoid arthritis is commonest in those who have reached the early degenerative period, and not infrequently it appears to be of the nature of a senile change. Again, rheumatoid arthritis tends to advance steadily, involving, in its progress, fresh joints from time to time, without relaxing its hold upon those which have been previously attacked; and although exacerbations occur from time to time, there are, in the vast majority of cases, no intervening periods of immunity. When speaking of chronic articular rheumatism, I described the changes which more commonly occur in joints which have been the seats of rheumatic inflammation, and these are quite different from the changes of rheumatoid arthritis; both the destruction of articular cartilage and the osteophyte formation, which are such characteristic features of the latter, being absent in the so-called chronic articular rheumatism, which is probably itself also a secondary affection.

All these considerations, when taken together, appear to me to prove sufficiently that rheumatoid arthritis is not a chronic form of true rheumatism, and to establish its independent character.

A second theory, which has received the powerful support of Mr. Jonathan Hutchinson, regards rheumatoid arthritis as a result of the combined action of the rheumatic and gouty processes, now the one, now the other element predominating. Unless we adopt, with Mr. Hutchinson, a very wide view of the respective provinces of rheumatism and gout, and regard both these diseases as merely the products of the action of their respective causes in persons who have inherited or have acquired an arthritic diathesis, it is difficult to reconcile with this view the characteristic features, both anatomical and clinical, of rheumatoid arthritis. It has been shown that the excess of sodium urate, which constitutes the characteristic feature of gout, is not present in the blood of those who suffer from rheumatoid arthritis; but

changes similar to those of rheumatoid arthritis are sometimes met with in joints which have been the seats of true gouty inflammation.

Both gout and rheumatism are systemic disorders, of which the articular lesions form merely a part—most important, no doubt, but not more so than the visceral lesions, which must be taken into account in the consideration of this question. If rheumatoid arthritis is an admixture of gout and rheumatism, how is it that it has not been conclusively shown to be associated with the abarticular manifestations of either of those diseases? Again, the argument from geographic distribution, which has been so well advanced by Sir Dyce Duckworth, is a very powerful one against the existence of any gouty element in rheumatoid arthritis, for in some countries in which rheumatoid arthritis is extremely prevalent, gout is an almost unknown malady.

If it be indeed the case that the articular lesions are the sole primary manifestations of rheumatoid arthritis, this fact is equally opposed to the view held by Dr. Fuller, that it is a distinct systemic disease, presenting analogies with, yet essentially distinct from, both rheumatism and gout.

Mr. Arbuthnot Lane goes so far as to maintain that rheumatoid arthritis is not a disease at all, in the strict sense of the term, but that the articular lesions are merely local effects of wear and tear, the results of pressure of the opposing surfaces upon each other. This view appears to me to be quite inadequate for the explanation of the phenomena of the disease, for it does not account in any way for the remarkably symmetrical distribution of the lesions, nor for the special liability of the peripheral joints. Moreover, the study of polyarticular rheumatoid arthritis, as it occurs in the rich as well as the poor, confronts us with many cases in which wear and tear cannot possibly account for the production of the lesions. For example, we may witness the invasion of the finger-joints one after another in symmetrical order in a patient who is perhaps confined to bed, or who has never done any hard work in her life, nor has been exposed to wear and tear of any kind; and this often in association with, and apparently as a result of, uterine derangements or mental anxieties. That rheumatoid arthritis is sometimes of the nature of a senile change, as Dr. Pye Smith holds, I would readily admit, but at the same time I am convinced that something more than mere wear and tear is concerned in its production, although these influences may play an important part when the nutrition of the joints becomes impaired.

It is this idea of a defective nutrition of the joints which underlies all the theories which regard rheumatoid arthritis as dependent upon a disorder of the nervous system, a view which was first advanced by Remak, and which has been ably advocated of late years by Professor Senator, Dr. Ord, Sir Dyce Duckworth, and others.

Although the advocates of the dystrophic theory hold various opinions as to the manner in which the dystrophic changes originate, they all agree that they are probably analogous to, although less intense than, those observed in the arthritis of locomotor ataxia.

Some have thought that rheumatoid arthritis is the result of primary lesions of the nervous system, whereas others refer the articular affection to a reflex influence originating in such local causes as uterine disorders, and spreading in a like reflex manner from one joint to another.

If the dystrophic theory be accepted, the difficulties presented by the diverse clinical forms of the disease are at once removed, for such dystrophic changes, as these are thought to be, may probably originate in a variety of manners; and whilst we may suppose that polyarticular rheumatoid arthritis may originate either in some depression of function of the nerve-centres, due either directly to the general condition, or reflexly to uterine or other local disorders; the localised form may be regarded as a dystrophy of a joint which has been the seat of injury or some other local damage. The resemblances which exist between the lesions of rheumatoid arthritis and those of an acknowledged dystrophy of the joints, viz., the arthropathy of locomotor ataxia, supply the strongest argument which can be brought forward in support of their dystrophic nature. In both conditions there is destruction of the articular cartilages and erosion of the heads of the bones; in both there is a tendency to the formation of osteophytic outgrowths; but in Charcot's arthritis the destructive processes are out of all proportion to the formation of osteophytes, and the one must be regarded as an acute, the other as a chronic change. In a paper dealing with the subject of Charcot's joint-disease Mr. Morrant Baker says: "For myself I cannot resist the belief that the disease is only, in an exaggerated form, what has been long familiar to us under the name of chronic rheumatic arthritis or osteo-arthritis. Apart from the *a priori* improbability of the sudden evolution of a new disease, I think we must come to this conclusion on comparing the pathological appearances with those presented by the specimens of chronic rheumatic arthritis

preserved in our museums. One is struck by the apparent identity in the two cases. There is the same kind of deformity of joint-surfaces; the same overgrowth, or apparent overgrowth, of one part with erosion of another; the same eburnation; the same thickening of tissues with infiltration of bony or calcareous deposits; the same dendritic outgrowths of synovial membrane; the same fibrous degeneration of cartilage." Further evidence of similarity is afforded by the fact that Professor Charcot himself originally described the arthropathy of *tabes* under the name of "*rhumatisme noueux, d'origine nerveuse.*" We may consider, then, as established, the first and most important point in the chain of reasoning, namely, that the changes observed in joints which are the seats of rheumatoid arthritis closely resemble those which are found to result from a definite lesion of the nervous system, and which must be regarded as dystrophic changes.

The second point to be considered is whether the distribution of the lesions is such as might be expected in a nervous arthritis. The arthritis of locomotor ataxia bears more resemblance to the localised than to the polyarticular form of rheumatoid arthritis, for it usually affects one or more of the larger joints only; but there are other varieties of joint-lesions which are thought, with good reason, to be dependent upon nerve-lesions, and in some of these a number of joints are attacked.

Among the causes of nervous arthritis which have been described, that which most closely resembles the exciting causes of rheumatoid arthritis is concussion of the spine; and although the joint-lesions which have been observed to follow this accident have approached more nearly in their clinical features to those of gout and rheumatism, and have run an acute course, ending in recovery, they have, as a rule, assumed the peripheral and symmetrical distribution which is so characteristic of rheumatoid arthritis. The recorded instances of arthritis following concussion of the spine are few in number. In one recorded by Dr. J. K. Mitchell in 1833, the patient was a medical man who had previously suffered from acute rheumatism; who was thrown from his carriage in such a manner that he struck the ground with the back of his neck and shoulder. Partial paralysis of the arms and complete paralysis of the legs followed immediately upon the accident. On the following morning the joints of the hands and the wrists became swollen and painful, and the pain, which was aggravated by pressure or friction along the spinal column, was relieved by the application of remedies to the same part. The patient recovered completely in time. In

another case described by Sir William Gull, a man aged thirty-eight, after an injury, had partial paraplegia and weakness of the sphincters. The joints affected were those of the hands and feet, and also the wrists and ankles. The appearance of the joints resembled that seen in gout. Recovery followed in several months. Mr. M'Ardle has recorded the case of a man aged sixty, who fell backwards upon a flagged floor. Here the hips, knees, and ankles were affected, but the feet escaped. There was paraplegia affecting the legs only. Recovery was slow, but eventually complete. A fourth case was recorded by Mr. Wherry of Cambridge. The patient, a man aged thirty-four, fell from a haystack, striking his left side. When brought to the hospital he was semi-conscious, answering questions when roused. The articular lesions developed about a week after the accident, the joints affected being the wrists, those of the fingers, the ankles, and, probably in a lesser degree, the hips and knees also. In addition to this there was localised sweating of the left side of the forehead, and herpes over the left supra-orbital nerve. Mr. Wherry says: "There was not any difference between the appearance of the joints and that which manifests itself in gout or rheumatism." And further: "The small joints, wrists, and ankles were most affected, the left wrist acutely." In this case also the joints recovered completely.

Professor Senator speaks of the symmetrical onset and progress of rheumatoid arthritis as being hardly explicable except on the supposition of a central cause situated in the central nervous system.

It is certain that the symmetry of the lesions in rheumatoid arthritis is altogether greater than in any other articular disease. Traces of a symmetrical tendency are noticeable in cases of acute articular rheumatism, and more clearly in the distribution of the subcutaneous fibrous nodules, but only exceptionally are they at all conspicuous. It is interesting to note that, as Dr. Ord has pointed out, symmetrical arrangement of lesions has not always been looked upon as evidence of nervous influence, and in his "Surgical Pathology" Sir James Paget advocated the view that symmetrical lesions are due to diseases in which the origin of the morbid process is in the condition of the circulating fluid.

Whether or no both influences have the power of producing symmetrical lesions in a greater or less degree, we are, I think, justified in concluding that the distribution of the articular lesions of rheumatoid arthritis is such as might be looked for in lesions dependent upon nervous influences.

The third argument is derived from the consideration of the ætiology of rheumatoid arthritis.

Among the causes of the disease uterine derangements occupy a very prominent position. Speaking of this point, Dr. Ord points out how great is the power of the uterus and its appendages of producing, through centripetal nervous influence, excitement of the spinal cord, and he suggests that in some instances, such excitement "may be reflected along the same paths which in primary affections of the spinal cord, have led to the affection of joints." On the other hand, when it is considered how great the influence of uterine derangements is, in lowering the general health, we may readily suppose that the disease results from the effects upon the nerve-centres of this condition of ill-health, and Dr. Ord himself suggests that debility and anæmia, by increasing the morbid reflex excitability of the spinal cord, will tend to assist the reflex action. Further evidence is supplied by the influence of emotional and mental disturbances in favouring the development of rheumatoid arthritis, and upon this point Senator lays special stress. Again, cold and damp are potent exciting causes of a variety of nervous disorders, as is also local injury. It will be seen, then, that the causes of rheumatoid arthritis are such as might be expected to give rise to a disorder having for its seat the nervous system.

The argument from treatment is also by no means without weight in this connection. It is now becoming generally recognised that the lines of treatment which are followed by the most satisfactory results in rheumatoid arthritis are such as are directed to the improvement of the general nutrition, and that the measures which are most beneficial in rheumatism and gout do no good, and often do much harm, if they are carried out in such cases. Again, the success which has attended the employment of electricity, in the hands of competent observers, points in the same direction.

There remains to be considered the argument based upon the almost constant association with the articular lesions of rheumatoid arthritis, of such phenomena as result from nerve-lesions, but I think that this argument may easily be pressed too far. I believe that, with the exception of some of the early symptoms to which Dr. Spender has called attention, and the numbness and tingling which appear actually to precede the development of any changes in the joints in some cases, these associated nervous phenomena are for the most part secondary rather than primary accidents of the disease. The muscular atrophy which constitutes so striking

a feature of rheumatoid arthritis is, I believe, merely an arthritic muscular atrophy, such as may follow any lesions of the joints, either slight or severe, and, as Charcot has pointed out, it is only more extensive in this than in other forms of articular disease because of the prolonged course and irritative character of the lesions. In its general features, in the association with it of increase of myotatic irritability, and in the deformities to which it ultimately gives rise, the muscular atrophy of rheumatoid arthritis resembles other kinds of arthritic muscular atrophy, and in the great majority of instances its development follows the onset of the disease in the joints.

Dr. Ord is inclined to take a different view of the matter, believing that, in some instances at least, there is a progressive dystrophy of the joints, "marching with progressive atrophy of muscles, and with atrophy of other tissues of the limbs." That this is sometimes the case cannot be questioned, but I doubt whether such cases can be regarded as examples of rheumatoid arthritis pure and simple, and should not rather be looked upon as belonging to the group of articular lesions which are of definitely nervous origin. However, the distinction is not really of much importance, for if rheumatoid arthritis is dystrophic arthritis, it can no longer be defined as a definite disease due to the action of one single cause; and it matters not whether the dystrophy results from some gross nervous lesion, or from more subtle influences, since the characteristic changes in the joint-structures constitute the sole criterion of the disease.

MM. Pitres and Vaillard are inclined to assign both the muscular and cutaneous atrophies to peripheral neuritis, a view which is not easily reconciled with the increase of myotatic irritability which is observed in so many cases.

At present we know little or nothing of the part played by peripheral neuritis in this disease. Should further observations confirm, for the bulk of the cases, the results obtained by these observers in a very small number, this element must obviously be taken into account, and it will become a question how far the lesions of peripheral nerves are instrumental in determining the irregularities in the relation of myotatic irritability to the muscular atrophy, the occurrence of numbness and tingling, cutaneous dystrophy, and, possibly, the changes in the joints themselves.

Pronounced dystrophic changes of the skin and nails are far less common than muscular atrophy, but they may be developed at an early stage of the disease, soon after the neighbouring joints have been attacked. In the cases examined by MM. Pitres

and Vaillard they were present, and the cutaneous changes were found to be most advanced in the case in which the cutaneous nerves had suffered most severely. In some cases it seems that, as in other articular diseases, the glossiness and atrophy of the skin result from the extension of inflammatory changes from the joints to the nerves in their immediate neighbourhood.

In the present state of our knowledge the dystrophic theory of rheumatoid arthritis must remain only a theory; but I would maintain that it affords the best explanation of the peculiar features of rheumatoid arthritis, of the variety of its clinical forms, in spite of the identity of the articular lesions, and of the character and distribution of those lesions; and would call to witness the increasing favour with which it is regarded by the profession at large.

If it be granted that we have in polyarticular rheumatoid arthritis a dystrophy of many joints resulting from the action of depressant causes upon the central nervous system, or produced in a reflex manner, as Dr. Ord suggests, it is but a small step to allow that similar dystrophic changes may occur in a single joint which has sustained injury either from direct violence or from inflammatory processes of which it has been the seat, or even as the result of senile decay. In this way we may explain the occurrence of identical morbid changes as the result of the action of a variety of causes, and the appearance of rheumatoid arthritis sometimes in the guise of a generalised disease, at others as a secondary or merely local morbid process.

CHAPTER X.

THE TREATMENT OF RHEUMATOID ARTHRITIS.

The prognosis of rheumatoid arthritis is more hopeful than was once believed—Depressant treatment injurious—Rest in more acute cases—Diet—Alcohol—Alkalies and colchicum have no beneficial effect—Guaiacum—Arsenic—Iodine—Iodide of potassium—Iodide of iron—Cod-liver oil—Tonics—Salicylates—Hyoscyamus for muscular cramps—Removal of cause—Clothing—Change of scene—Local treatment—Electrical treatment—Dr. Steavenson on electric baths in rheumatoid arthritis—Mode of administration—Thermal treatment, directed to digestive functions, anæmia, condition of joints—Aix-les-Bains—Bath—Aachen—Other thermal stations.

Up to a comparatively recent time it was very generally held that no treatment was of any real avail to sufferers from rheumatoid arthritis, and although it was possible to alleviate some of the symptoms, it was thought that the disease must necessarily progress, involving one joint after another, until the patient became an almost complete cripple. More recently this gloomy prognosis has been considerably modified, and although in the history of the treatment of rheumatoid arthritis no very signal triumphs can be recorded, and no drug has yet been discovered which has an action comparable to that of colchicum in gout or of the salicylates in rheumatism; much may be done to alleviate the suffering which the disease entails, and in the earlier stages we may reasonably look for an arrest of the morbid process, or even for almost complete recovery.

Since the changes in the joints which are characteristic of rheumatoid arthritis are of an essentially destructive kind, no line of treatment can entirely undo the mischief which the disease has wrought, nor, except in the earlier stages, restore the joints to a condition of even apparent health; there is, however, no doubt that a considerable degree of enlargement may subside in time, and not infrequently the diseased articulations, although not completely restored, may give no further trouble.

In the earlier days of our knowledge of rheumatoid arthritis it was customary to prescribe methods of treatment which, although they afforded temporary relief to the patients, tended to encourage rather than to check the subsequent progress of the malady. Haygarth and others placed great faith in the action of leeches, which, when applied over the diseased joints, often give great relief from pain; but frequent local depletion, such as this plan involves, cannot fail to depress still further the already lowered condition of the system, upon which the onset of rheumatoid arthritis so frequently depends.

The same objection may be raised to such restriction of diet as is so beneficial in cases of gout, but which is apt to have a distinctly injurious effect in rheumatoid arthritis. Indeed, it cannot be too strongly insisted that rheumatoid arthritis requires to be treated on entirely different principles from rheumatism or gout, and that our efforts must be directed rather to sustaining the strength of the patients than to the elimination of any morbid product from the blood and tissues. In his work on "Gout and Rheumatic Gout" Sir Alfred Garrod speaks as follows upon this point:—"It is most important that we should not attempt to treat the disease in the same way as gout, for colchicum is, for the most part, injurious, and a spare diet is far from beneficial; nor must we deal with it as with simple rheumatism, for the alkaline treatment, so serviceable in the latter, is generally prejudicial in the former, disease. My own experience enables me confidently to state that much injury is frequently produced by injudicious treatment in rheumatoid arthritis, and especially from its being confounded either with gout or rheumatism." M. Besnier endorses these remarks, and recommends them to the notice of his fellow-countrymen; who are, he says, too apt to refer the lesions of this disease to gout, and to submit the patients to a lowering plan of treatment. Dr. Kent Spender, in a recently published paper, enforces a similar lesson, as have many other modern writers upon the subject.

For my own part, I am convinced that the practice which still so largely prevails of placing sufferers from this disease upon a low diet, and denying them all alcoholic stimulant, with the exception of a little whisky or claret, is distinctly prejudicial. In those exceptional cases in which the disease assumes a more or less acute form, and there is well-marked febrile disturbance, it is, of course, desirable to treat the malady like other febrile disorders, for a time, and to keep the patient at rest in bed. In the more chronic cases, on the other hand, there is no necessity

for absolute rest, and a moderate amount of exercise may usually be taken with advantage to the general tone of the system. Yet it is important that the exercise should not be excessive, as the use of the joints beyond a certain extent is likely to aggravate the local condition.

Diet.—In the more acute cases the diet should be light but nutritious, but in the more chronic forms there is no reason for imposing any restrictions. Sir Alfred Garrod writes as follows on this point:—"I consider it of the utmost importance throughout the whole course of the disease to support the system, and to allow the patient as nourishing a diet as he is capable of properly digesting. Meat should form a considerable portion of the diet, and when it cannot be taken as ordinarily cooked, it is of advantage to have it in the form of potted meat or panada, taking care that the whole of the juice of the meat be introduced." When the patient's digestion is weak, it is important to administer medicines to improve the gastric condition, in order that the food may be properly assimilated, and Sir Dyce Duckworth recommends that mustard should be freely taken by the patients with their meals.

Alcohol.—There is no evidence that alcoholic beverages are in any way injurious when the disease is once developed, or have any share in its causation; and malt liquors, or the more generous wines, seem to be often extremely beneficial when taken in small quantities at meals. Thus a glass of stout may be prescribed at the midday meal, or a glass of port or burgundy.

Of the drugs which are commonly prescribed for rheumatoid arthritis, some have apparently little value, others are very uncertain in their effects, and some few appear to be distinctly useful.

Alkalies and Colchicum.—The alkalies and colchicum are now seldom used, and appear to be without any beneficial effect. Guaiacum, which was frequently prescribed, gave very uncertain results in the cases in which it was tried by Professor Charcot.

Arsenic.—Arsenic is one of the drugs which has found most favour, and it has been very largely given since it was first recommended for the treatment of rheumatoid arthritis by Dr. Jenkinson of Manchester in 1809, and was employed later by Dr. Bardsley. M. Charcot found that the effects of arsenic were, like those of guaiacum, uncertain, and others who have found arsenical preparations to be of signal service in some cases have also found them valueless in others. Dr. Hilton Fagge, in his "Principles and Practice of Medicine," speaks of arsenic as one of the most useful drugs for this disease, and its proved value in

some cases certainly entitles it to trial. It may be conveniently given in combination with other treatment. M. Noël Gueneau de Mussy has strongly recommended the use of arsenical baths, which should be given every alternate day, at a temperature of 33°–36° C. (91°–97° F.). He recommends that each bath should contain—

Sodii bicarbonatis	100–150 grammes.
Sodii arseniatis	1–8 „

Iodine and the Iodides.—Iodine and the iodides are very extensively employed in the treatment of rheumatoid arthritis. Lasègue recommended the administration of free iodine in the form of the tincture in doses of from 8–10 minims at meal-time. In order to render the drug palatable, it should be added to a glass of sherry. MM. Charcot and Trastour, who had tried this plan of treatment in a number of cases, spoke well of it. The iodide of potassium has been, and is still, extensively employed, and has been found by many to give good results, but it has not appeared to me to approach the iodide of iron in the power of alleviating or arresting the disease. Iodide of potassium appears useful in cases in which the pains are increased by the warmth of bed. The drug is best given in moderate doses, and its administration should be stopped from time to time. Sir Alfred Garrod considers that the iodide of iron is superior to all other drugs in the treatment of rheumatoid arthritis, and Dr. Fuller also regarded it as a valuable remedy. It may be given either in the form of the syrup or as a pill. I confidently express my conviction, based upon the observation of its effects in a number of cases, that there is no known drug which produces such satisfactory results as iodide of iron in the treatment of rheumatoid arthritis. I have repeatedly convinced myself of its value, both when administered alone and with arsenic. It is, however, most important that the treatment should be coupled with nutritious diet and hygienic surroundings; and as these conditions are often most difficult to obtain among hospital out-patients, the results are apt to be less marked in such persons than in those who are in better circumstances. In some cases this line of treatment produces an apparently complete arrest of the disease, and in many others there is very conspicuous improvement. It is necessary to continue the administration of the iodide of iron, with occasional short intermissions, over a period of several months, and no obvious improvement should be looked for within a period of one or two months.

Cod-Liver Oil.—There is a consensus of opinion amongst those who have written upon the treatment of rheumatoid arthritis of late years, that cod-liver oil is a most valuable drug in this disease, and it is specially useful in cases in which the patients are ill-nourished and debilitated. The oil should be taken regularly and in sufficient doses, at least during the winter months.

Tonics.—Quinine, nux vomica, and other tonics are often useful adjuncts to other forms of treatment, and I have sometimes seen good effects from the administration of an alkaline quinine mixture containing some iodide of potassium in cases in which the disease assumes an unusually acute form.

Other Therapeutic Measures.—Dr. Fuller spoke highly of the value of an infusion of the leaves of Fraxinus excelsior, and Dr. Ringer has obtained good results with Actœa racemosa. When the articular pains are severe, some relief is often obtained from the administration of salicine or sodium salicylate ; but the action of these drugs, which should not be given continuously for any length of time, is simply palliative, and is not in any way comparable to that observed in cases of genuine rheumatism. In cases in which painful muscular cramps are prominent symptoms, I have found hyoscyamus afford very great relief, and in a number of cases in which I have given it, its administration has been followed by a rapid subsidence of the pain, not only once, but repeatedly.

Ichthyol has lately been strongly recommended by Lorenz and others as a valuable drug in the treatment of rheumatoid arthritis as well as chronic articular rheumatism ; but Meyer, after an extensive trial, pronounced it useless. I have not myself had any experience of the use of this drug, of the nature and properties of which some account will be found in an earlier chapter.

If any obvious provoking cause of the disease is present, such as uterine derangement, treatment should be directed thereto ; and in cases in which it seems probable that dampness of the house or neighbourhood is apparently influential in favouring, if not in causing the disease, removal to a fresh locality is often very beneficial. Attention should also be paid to the clothing of the patients, who should wear woollen underclothing over the entire body. Another important point is the removal as far as possible of anxieties or worries, which have been shown to exercise a very unfavourable influence upon the course of the malady ; and change of air and scene must, therefore, be included among the therapeutic measures to be recommended in

many cases. The regular action of the bowels should be encouraged, if necessary, by the administration of laxatives.

Local Treatment of the Joints.—Special treatment directed to the joints is often useful. When the articular pain is severe, the local vapour-bath, or the embedding of the limb in hot sand, as recommended by Trousseau, often affords great relief. Such local applications as belladonna liniment, or a mixture of this preparation with an equal quantity of tincture of iodine, are also useful in these cases. Plasters have the advantage of giving some support to the damaged joints without restricting their movements to any very serious degree, and their use is therefore to be preferred to that of splints.

Electrical Treatment.—The electrical treatment of rheumatoid arthritis, originally recommended by Remak, and since advocated by Althaus and many others, appears to have considerable value in many instances; and I have met with cases in which treatment by drugs appeared to have no influence in checking the progress of the disease, but in which considerable improvement resulted from the careful administration of electric baths. Remak, Meyer, and others recommended the application of a continuous current to the sympathetic nerve, the zinc pole being placed in the submaxillary region, the copper on the opposite side of the seventh cervical vertebra.

My friend Dr. Steavenson has been good enough to favour me with the following account of his experience of the treatment of rheumatoid arthritis by the electric bath, and of the manner in which it should be administered. Dr. Steavenson writes: "In the treatment of rheumatoid arthritis by the electric bath we have obtained encouraging results. This is, perhaps, not altogether a matter for surprise if we accept the theory of the probable nervous origin of the affection. Relief has been afforded by the use of vapour-baths, but often for the patient to be worse afterwards; but the relief that has been derived from the electric bath appears to be more substantial and permanent.

"The bath itself is made of some non-conducting material, such as porcelain or wood, and is filled with water at the temperature of 98°–100° F. The water is deep enough to cover the patient, with the exception of the head. A copper plate, connected with the negative pole of a constant current battery, is placed at the foot of the bath, and another connected with the positive pole is placed at the head. A support is provided for the head and shoulders, consisting of a wooden frame with webbing interlaced and stretched across it, so that they may not touch the metal

plate. A Stöhrer's constant current battery of about thirty cells is one of the best to employ, or a battery composed of about forty No. 1 size Leclanché cells. It is always best to employ a highly graduated galvanometer (one that will indicate a current up to 250 milliampères), as the strength of the cells varies according to the time they have been in use and the condition of the exciting fluid. A medical man should always be present to regulate, increase, or diminish the current. The patient can be provided with a bathing-dress, and with female patients a nurse should always be in the room. The medical man's attendance is only required while the current is flowing. An arrangement exists on the battery for completing the circuit and for gradually increasing the strength of the current without any interruptions taking place, so that all chance of giving the patient a shock is avoided. The current is slowly augmented, and the only sensation that the patient experiences is a slight pricking, often more noticeable at the feet, where they approach or touch the lower metal plate. A galvanic taste is also experienced in the mouth as the current becomes stronger. The full strength which it is desirable to obtain is one of 200 milliampères; and of this it has been estimated that the patient receives about forty milliampères, the other four-fifths of the current passing through the water.

"The patient is kept in the bath under the influence of the full current for ten minutes; the strength of the current is then very gradually reduced. When the stress of the disease has fallen on the hands, and they have become distorted and useless, a series of metal handles of different sizes covered with house-flannel have been employed. The largest handle that can be got into the patient's hand is first used, and is attached to the negative pole of the battery, in place of the foot-plate. The current then enters the body at the spine, and leaves it by the hand which grasps the handle. This localises the current more, but should only be used for about the last five minutes of the bath, and should never entirely take the place of the general bath, which probably influences the whole system. By degrees larger handles can be used, and by this means it is sometimes possible gradually to open the hand, and render it more useful. Often the swelling and distortion of the joints is reduced, and this seems to be due to the effect of the current of electricity. The hands may also be made to grasp a metal bar resting across the bath, but covered with moistened house-flannel. In this position the hands are raised out of the water, and probably get

more of the current, but the entire current flowing through the battery requires to be very greatly reduced, for the patient cannot bear more than ten or twelve milliampères when concentrated upon the hands in this manner. When any of these changes in the direction of the current are made, the strength has to be gradually reduced to zero, and increased again after the change has been made, for if the wires were detached from the plate at the bottom of the bath when the full strength of 200 milliampères was passing, the patient would receive a very unpleasant and severe shock. Should the patient's head feel full or throbbing during the bath, a cold wet towel may be placed upon the top of the head.

"An electric bath should not be taken too soon after a full meal, and the treatment should not be persevered in if a feeling of languor and depression is found to follow each bath. The patient's back, where it has been opposite to the upper electrode, will be found of a bright red colour, which will remain for about two hours. There appears to be no tendency to catch cold after an electric bath, as is often the case after an ordinary hot bath, and the patient generally feels exhilarated and better.

"No actual improvement is noticed until six or eight baths have been taken, and often not until the completion of a course of twelve or fourteen; but on looking back to the condition of the patient before the treatment was commenced, it is generally possible to notice some amelioration of the symptoms. For instance, a patient who could only rise from one step to the next by pulling on the banister can make the ascent without such assistance, or a woman who could not hold her needle finds that she is able to use it slowly. It is best that the first five or six baths should be taken on consecutive days, and then, after the electricity may be supposed to have produced some influence on the system, the next six baths may be taken on alternate days, and then every third day until the completion of the course. The theory of the origin of rheumatoid arthritis in many women, through reflex action following the irritation of the spinal cord by prolonged congestion and inflammation of the pelvic organs, is somewhat strengthened by the fact that the sedative action of the positive pole on the spinal marrow appears to be followed by some alleviation of the symptoms; and the chances of this theory being probably a correct one led to the placing of the positive pole at the head of the bath. The rheumatoid condition is frequently recognised as associated with catarrhal endometritis, and the question arises of the relation they bear to each other. The

superiority of the results claimed by the treatment of these pelvic troubles by electricity, when the negative pole is applied to the uterus and the positive pole to the lower dorsal vertebræ, may also be partly due to the sedative action of the positive pole on the spinal cord."

Thermal Treatment.—There remains to be considered the treatment of rheumatoid arthritis by mineral baths and waters. This is one of the diseases in which thermal treatment is most potent for good, if suitably applied, but at the same time it may be attended by disastrous consequences if carried to excess, or if of a wrong kind.

It must be remembered, in this connection, that a treatment which is followed by considerable temporary relief may be in reality very harmful, as, for example, the use of general vapour-baths. Such baths are almost invariably attended by a considerable alleviation of the articular pains and increased mobility of the joints, but this relief is dearly bought at the expense of an increased rapidity of the progress of the disease in response to the lowering treatment. In the same way any course of thermal treatment which has a debilitating effect will inevitably tend to aggravate rather than improve the patient's condition. The normal performance of the digestive functions is a matter of much importance in patients suffering from rheumatoid arthritis, for upon this depends the nutrition of the patient to a great extent, and his power to combat the disease. When the digestive functions are impaired, a course at such a spa as Homburg, Carlsbad, Marienbad, Kissingen, Leamington, or Woodhall may prove beneficial, always provided that the patient's general health be not lowered thereby. In other cases in which anæmia is a prominent symptom, resort to some ferruginous spring may be recommended, such as Spa, Schwalbach (at which place the waters contain carbonate of iron held in solution by an excess of carbon-dioxide), or St. Moritz, where the dry bracing air of the lofty Engadine Valley is an additional advantage. These are, however, merely accessory treatments, which have only an indirect action in checking the disease by improving the general health, but there are certain forms of mineral-water treatment which appear to have a more direct power of arresting the progress of the malady. This is especially the case with certain stations at which the thermal waters are employed in the form of douches, and at which massage combined with douching constitutes an essential feature in the treatment.

This form of treatment is most skilfully carried out at Aix-les-

Bains (Savoie), and I have myself had many opportunities of witnessing the beneficial effect of a course of treatment at Aix in cases of rheumatoid arthritis. In some early cases it has been followed by what was apparently a complete arrest of the disease, especially in cases which have already yielded in a satisfactory manner to drug treatment; and in other instances the improvement observed, although not permanent, has been maintained for a considerable time. I believe that the baths are most effectual after the patient has been taking iodide of iron, cod-liver oil, or other suitable drugs for some months previously, but during the thermal course it is best to entirely discontinue other treatment for the time.

It is no easy matter to be sure how far the success of the treatment in cases of rheumatoid arthritis is dependent upon the nature of the mineral water employed (at Aix the sulphur-water is employed for this as for other purposes), and how far merely upon its thermal quality; but I am inclined to think that climate and surroundings are not without an important influence upon the result.

The Aix treatment by massage-baths is now extensively carried out at other places; and among these Bath occupies a prominent position, for there the newly-opened establishment contains the most perfect appliances for the purpose, and Bath has long enjoyed a considerable reputation for the treatment of rheumatoid arthritis. Dr. Kent Spender, in his recent work on this disease, to which I have already referred several times, says that in the tractable cases, in which the joints and muscles suffer, and in which there is rapidly developing dystrophy of the skin and muscles, but in which there is neither ankylosis nor hopeless atrophy, the Bath waters may be used with the greatest confidence; and in a more recent paper he still further defines the cases in which the greatest benefit may be looked for, for he says: "Most good is to be expected from our thermal waters when there is an antecedent history of rheumatism or gout. In other cases, when osteo-arthritis is distinctly a sign of local or general deterioration, internal medicinal treatment is of at least equal value." Mr. Craddock also speaks of the good results obtained with the Bath treatment in cases in which rheumatoid arthritis, or a condition which closely resembles it, follows upon true rheumatism, but adds that in pure rheumatoid arthritis he thinks it more frequently does harm than good. It will be seen from these opinions that some discrimination is necessary in selecting the cases which are most likely to be benefited by the Bath course.

Aachen (Aix-la-Chapelle) must also be mentioned among the stations at which the thermal treatment of rheumatoid arthritis is most successfully carried out. Dr. Beissel of Aachen speaks of the good effects of the thermal baths, combined with the local douche, massage, and passive movement of the joints, in the more chronic forms of the disease, and he also recommends the association of the electrical with the thermal treatment.

Among other resorts which may often be visited with advantage by patients suffering from rheumatoid arthritis, Buxton and Harrogate in England, Bourboule and Mont Dore in France, and Hammam R'hira and Hammam Meskoutin may be included.

There are some cases in which no treatment, whether by drugs, electricity, or thermal baths, appears to be of any avail to check the progress of the disease, which pursues its destructive course in spite of all the endeavours of the physician, and ultimately ends by rendering the sufferer a hopeless cripple. Such cases only tend to enforce the lesson that a disease which may have such terrible results should be combated at its very earliest appearance by prompt and appropriate measures.

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